Subterranea

The Magazine for Subterranea Britannica

Subterranea Britannica **April 2020 Issue 53**

IN THIS ISSUE

Gubel Bloodhound Missile Site, Switzerland
Underground at Deepdene House, Surrey
Christ's Hospital Tunnels
Southwark Borough Control

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life.
Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.
Contributors to *Subterranea* also give their permission for articles and images to be reproduced on Sub Brit's website.

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Contents

Chairman's Welcome 1
Minutes of Committee Meeting 2
Autumn Study Weekend 2020 3
Dates for Your Diary 4
AGM & 2020 Committee 4
Trustees' Report 2019 5

News

Archaeology 7
Conservation and Heritage 7
Military and Defence 10
Mines and Mining 13
Miscellaneous 14
Publications 18
Tunnels & Tunnelling 20

Features

Tunnels beneath Christ's Hospital, Horsham 22
Subsurface lavatories at Kennington Lane, London 27
New finds underground at Deepdene House, Surrey 28
John Logie Baird's TV equipment? 35
Gubel Bloodhound Missile Site, Switzerland 36
Fiddler's Ferry - an Early Retirement 42
Southwark Borough Control, Southeast London 48
Under the surface - Maidenstone Hill, London 53

Front cover photo: *A view down the main thoroughfare of the 'tube' at Christ's Hospital near Horsham. West Sussex. On the left hand wall are current services including two large water mains (to provide continuity during maintenance work). At the bottom are electrical supplies and between lie phone, data and alarm circuits, all installed in a well structured fashion. There is even a dedicated circuit for the school bells. The brackets on the roof were originally supports for the original water supply and those on the right-hand wall from the days of the centralised boiler house. The blue cylinder in the near distance is a redundant hot water tank from one of the boarding house boiler rooms. The ceiling shows signs of recent works to strengthen the original concrete. Photo Nick Catford*

Back page upper: *Sub Brit members assemble for a group shot against the backdrop of Fiddler's Ferry Power Station, near Warrington. The chimney behind is 650 feet tall - higher than the BT Tower in London. Since our visit the station has ceased production. It went silent in the first week of March 2020 and the chimney will smoke no more.* 'One may have a blazing hearth in one's soul and yet no one ever came to sit by it. Passers-by see only a wisp of smoke from the chimney and continue on their way'. *Vincent Van Gogh. Photo Michele Clement-Delbos*

Back page lower: *Access to the Southwark Borough Control at the junction of Peckham Road and Vestry Road, London SE5 in August 2001. A health centre stood on the site until the late 1990s with the Southwark Borough Control located in the basement. When the building was demolished, the basement was left intact with access through the metal hatch seen here. The Council and local residents are concerned that nothing has happened since the site was sold to a private developer in 2001. Photo Nick Catford*

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Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the Editor etc are welcome.
However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Martin Dixon

As each new year dawns, it's time for our annual accounts to be produced and inspected and as ever we are grateful to our Treasurer Tony Radstone for his sterling work in keeping Sub Brit solvent and legal. We are financially in good shape although the final balance this year is somewhat inflated by the number of early renewals following implementation of the new membership system. Our full year accounts are being inspected by our independent examiner and will be available to all prior to our AGM on 25 April.

When we became a charity back in 2011 we qualified for Gift Aid and the Committee took the decision to use this extra income to contribute to worthy projects rather than subsidise membership. As a result over the years we have helped fund projects around the country that help interpret, restore, protect or document underground sites. We are particularly keen on projects that allow increased public access such as installing safe access routes or providing torches and protective equipment for more hazardous sites.

Over the years we have donated tens of thousands of pounds to scores of projects and I thought it was worth reminding everyone that this funding is available. The application form can be found on our website at https://www.subbrit.org.uk/about/ and applications should be sent to Tim Wellburn who coordinates them on behalf of the Committee.

Projects already supported range from printing of leaflets and guidebooks through to major engineering projects (new stairs at both Williamson's Tunnels and Wartling for example). There's no fixed limit to applications and donations made have ranged from just £50 to over £5,000.

Whilst on the subject of money, a reminder that as a charity we are able to accept legacies.

Leaving a charitable legacy will also reduce the taxable value of your estate and can also cut the rate of inheritance tax due. Clearly this is a very personal decision but if you are considering making or updating a will then do consider the benefits of including donations to charity. Any legacies received by Sub Brit would allow us to support even more groups to preserve and protect our underground heritage.

Of course there are lots of way to support Sub Brit other than financially. Over the last year the platform that supports our public website (www.subbrit.org.uk) has been updated and it's now much more straightforward to add new locations to our database of sites. Neil Iosson is acting as our website content editor and I know would welcome volunteers.

We're particularly keen to find members with a special interest in sites that are currently under-represented on the website; these could be anything from canal tunnels to crypts and catacombs. If you're interested in helping out then do contact Neil on niosson@subbrit.org.uk . Ideally we're looking for both text and images but the new site is more flexible and allows these to be added separately if necessary.

A particularly warm welcome to new members for whom this is their first edition of *Subterranea*. I hope you enjoy the read and will be spurred into writing for future editions of the magazine. As usual, I'm looking forward to meeting many members – new and old alike – at our AGM and Spring Meeting and throughout the year.

chairman@subbrit.org.uk

Stop Press

When I wrote the Chairman's welcome in early March, little did I realise the clouds of Covid-19 that were about to descend upon us. As we go to press the Coronavirus crisis is having a dramatic effect on all of our lives. Sub Brit has had to cancel (hopefully postpone) events across the country and further afield in order to follow the strict protocols that have been imposed. Apologies to anyone who had made travel plans around these events but it was a decision we had to make.

We now plan to hold our AGM in conjunction with our Autumn Meeting in Sywell (Northampton) on 17 October. In the meantime our 2019 Trustees' Report is included elsewhere in this edition and our full Report and Accounts are available to view online at www.subbrit.org.uk/about . Linda Dixon, our Secretary, has also written a short piece summarising our current Committee and roles which now will be in place for most of 2020. This should be particularly useful to new members.

I hope that the articles within this edition of Subterranea will help take your mind off the crisis. Many thanks to all concerned who have had to work in a different way to usual in order to comply with 'social distancing'. If you too are 'confined to barracks' then do consider writing an article for a future edition about your personal passion. We're lucky to have the members' forum where we can continue to share news and views; if you aren't currently a user then why not take the step to meet lots of fellow members online.

I look forward to being able to meet up face to face again and to properly greet new members. Many of us have made lifelong friends through Sub Brit and I hope this friendship will help make the coming months more bearable. I'm sure everyone will support those less fortunate than themselves and am convinced that with our special interest we can already envisage the light at the end of the tunnel.

Summary Minutes of Sub Brit Committee Meeting

8 February 2020 at Canada Water Library, Rotherhithe, London

Attendees Martin Dixon (Chairman), Linda Dixon (Sec), Tony Radstone (Treasurer), Paul Sowan, Jason Hughes, Chris Gray, Phil Catling, Bob Templeman, Richard Seabrook, Alistair Graham Kerr, Richard West (Membership Secretary). Apologies from: Tim Wellburn, Neil Iosson (co-opted in June 2019).

Health & Safety No issues were raised. Jason and Phil now have current Confined Spaces Certificates.

Changes to Trustees / Directors Tim Wellburn, Richard Seabrook and Richard West have now been registered as Trustees and Directors and Nick Catford removed at the Charity Commission & Companies House.

Preparation for the AGM Paul Sowan will not stand for re-election to the Committee at the next AGM. Paul has been a former Chairman and on the Committee of Sub Brit for as long as anyone can remember – he was thanked sincerely for all his many years of service. Alistair Graham Kerr has also decided not to stand – we thank him for his work. All other committee members confirmed their proposal to seek re-election.

Martin Dixon indicated that he was happy to stand for another two years as Chairman and then step down from the role. Martin has drafted the Trustees' Report – this was accepted. The Accounts have been finalised by our Accountant. Documents will be presented on the SB website prior to the AGM. The Committee agreed to leave subscription rates at their current level.

Grants/Projects We agreed to offer money to Derbyshire Caving Club for revised leaflets about Alderley Edge. Linda will order a reprint of the leaflets for the Cuckfield ROC post.

Systems All systems have now been migrated to the new web platform and the Committee are getting used to using the new way of working for event management, membership etc. Further training to be scheduled as required. Many thanks to Richard Seabrook for all his many hours of work to manage this successfully.

Membership Renewals Renewals are underway using the new system and going OK, although some members have experienced teething problems. Richard West will manage the final chaser by post in March, in time to get maximum renewals before the next *Subterranea* is mailed out.

Donations – the current system no longer supports donations alongside membership renewals; we will try to make this an option, possibly via PayPal.

Website Neil Iosson is still looking for volunteers to help load sites onto the website – we have a guide on how to do this; it is now much simpler and easy to do with our new systems.

Paddock There are ongoing meetings with Network Homes and other parties to try and restart public visits.

Day Meetings The Autumn 2019 meeting at Reading went very well, it was a very good venue and we had some excellent speakers. Linda has booked the London Metropolitan University on the Holloway Road for the AGM and Spring Meeting and booking is open; Phil has again lined up some good speakers. The Cirrus Room at Sywell, Northants, has been booked for the Autumn 2020 meeting, and again we have speakers lined up. There will be a day of visits on the Sunday which Phil is arranging with Ade Armishaw. The Spring Meeting and AGM date for 2021 has been set as 27 March, probably again at LMU.

Oslo weekend trip Good planning by Lars, Tony, and Martin – booking was set up on Eventbrite and filled in a couple of days. We discussed potential venues for next year – maybe Poland? Tony to do some research.

Day trips and Events Several in the pipeline – Mail Rail 'walk the rails' and extended tour; Crossness Pumping Station; Dover 'Dumpy' level; Peak District; Wartling bunker.

Officers' Reports All were submitted in advance and lodged on the Committee section of the Forum. Mike Moore will take some SB Site Directories to sell via his shop/website.

Next committee meeting 27 June 2020, Canada Water Library, Rotherhithe.

***Editor's Note**: The meeting was held before the current coronavirus emergency restrictions came into effect. As we go to press, the future events mentioned are clearly subject to revision and/or postponement.*

Advance Notice – Save the Date

Subterranea Britannica

Autumn Study Weekend 2020

Saturday 17 October 2020, commencing at 10.00am

Cirrus room, Aviator Hotel, Sywell Aerodrome, Northants NN6 0BN

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The day will take the usual format, with refreshments on arrival, before the meeting starts.
We have invited four speakers on a wide range of underground-related topics:

Jo Emery will be taking us behind the scenes at Drakelow WWII Shadow Factory and secret Cold War RSG/RGHQ
Sarah Smart from Mid-England Barrow on building the first barrow storage of cremated remains for thousands of years
Judith Hewitt from the Devil's Porridge Museum in Scotland will talk about the massive WWI munitions factory HM Gretna and the Quintinshill railway disaster
Keynote speaker is **Katie Rix** of *Berliner Unterwelten* who will be presenting new work on the Berlin underground ghost stations of the Cold War period

The programme and speakers will be confirmed on our website and as always we are very pleased to welcome short talks and/or updates from members – presentation facilities will be available. Short talks can be on any underground topic, and can last between five and fifteen minutes, so please send in your suggestions.

Our lunchtime break will be spent in a private behind-the-scenes tour of the fantastic Sywell Aviation Museum, on site at the Aerodrome. This will include the WWII and Cold War displays.

Plans for optional Sunday activities include a full day of underground visits in the area.
Confirmed is a guided tour of the Mid-England Barrow with lunch provided, and a boat trip through the 3000-yard-long Blisworth Canal tunnel.
Other visits are still being negotiated but we hope to include a visit to Catesby railway tunnel and some Cold War concrete.

Contact Phil Catling on pcatling@subbrit.org.uk

Bookings (with cost details) will open in the Summer

Non-members are very welcome to attend the Saturday talks and visits, but for insurance and logistical reasons, places on the Sunday visits on 18 October are restricted to SubBrit members and are available only to members attending on the Saturday.

*****

Special note: *As we go to press, our country is in lockdown mode. All future events are of course subject to confirmation and we suggest that members consult our website www.subbrit.org.uk regularly for up-to-date information, costs and booking details.*

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events

Sub Brit specific events

1 July Copy deadline for *Subterranea* 54

31 August *Subterranea* 54 published

6 September Visit to Dover Castle Dumpy Levels

17 October Autumn Meeting & AGM, Northamptonshire

18 October Sub Brit visits around Northamptonshire

1 November Copy deadline for *Subterranea* 55

Mid-December *Subterranea* 55 published

Other underground-related events

Potentially:

11 - 20 September Heritage Open Days, England

14 - 20 September Glasgow Doors Open Days

19 -20 September Open House London

Still listed, date tbc Doors Open Days, Scotland

Still listed, date tbc Open Doors, Wales

For web links to these events please visit *www.subbrit.org.uk/events*
or contact the organisation concerned

If you know of other relevant events run by other societies, please let us know so that they can be advertised in the next edition and on the website

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Sub Brit AGM and our 2020 Committee

Linda Dixon

Sub Brit's AGM was scheduled for 25 April 2020, alongside the Spring Meeting. As the meeting itself has been cancelled (due to Coronavirus), we have made the decision to postpone the AGM too and to run it alongside our Autumn Meeting on 17 October – fingers crossed! You will find all the normal documents for the AGM on our website, i.e. Minutes of 2019 AGM and the Trustees' Report and Accounts.

Our annual report is also already filed with Companies House and the Charity Commission. Our constitution doesn't specify when during the year our AGM is held and, in any case, these are exceptional times.

At the AGM, we would have been voting to elect our Committee for the coming year. In the absence of this, your Committee will continue as follows:

Chairman	Martin Dixon
Vice-Chairman	Tim Wellburn
Treasurer	Tony Radstone
Secretary	Linda Dixon
Membership Secretary	Richard West
Webmaster	Richard Seabrook
Day Meetings	Phil Catling
Website Content Editor	Neil Iosson (co-opted June 2019)
Ordinary members	Chris Gray, Jason Hughes, Bob Templeman

Nick Catford left the Committee during 2019 but he continues in the vital role of *Subterranea* Editor. Paul Sowan and Alistair Graham-Kerr have indicated their intention to stand down with effect from 25 April 2020. We thank them all for their hard work over the years. Saturday 25 April also happens to be Paul's 80th birthday so the cancellation of our meeting also prevents our raising a glass to Paul and all he has done for Sub Brit over the years. Happy Birthday Paul!

The Committee meets together three times a year, usually in or near to London. You can see from the summary reports of the Committee included in *Subterranea* the sorts of things which we discuss; we spend a small amount of time on 'formal' governance (annual reports, financial management and the like) and then move on to things like updates on our systems, grants made and applied for, arrangements and ideas for our Day Meetings; progress on our Study Weekends and any ideas and/or reports on site visits. We also work together and take decisions between meetings using a private section of the Members' Forum.

If there is anything that you would like the Committee to consider or discuss then we can all be reached via the Forum. A proposal is always more welcome than an issue alone! If you would like to join the Committee, then we'd suggest you have a good idea beforehand of where you can best make a contribution.

As a charity we're duty bound to consider public benefit in what we do and we're also governed by Company Law. If all this excites rather than puts you off then we'd be pleased to welcome you.

Please contact ldixon@subbrit.org.uk and I'll let you have some more information; we normally suggest attendance at a Committee Meeting to see how it works before making any firm commitment – the next is scheduled for 27 June 2020 in Canada Water, London.

Subterranea Britannica Trustees' Report 2019

Underground space has played a pivotal role in mankind's history. The dawning of each age (stone, bronze, and iron) was dependent on the exploitation of underground resources. The industrial revolution could not have happened without the tapping of coal and iron reserves and the construction of canal and railway tunnels. Military conflicts across the centuries have always had a strong interplay with underground activity, ranging from mining and countermining galleries, via the air-raid shelters of World War II to the vast command bunkers of the Cold War. Modern society would be unable to function without the extensive underground networks that bring utilities and transportation into everyone's daily lives.

Unlike most other structures, underground space cannot be casually seen in passing but has to be sought out. Subterranea Britannica's mission is to focus on the study, recording and preservation of our immense underground heritage. We strive to ensure that our hidden marvels are better known and appreciated by all.

1) Background

Subterranea Britannica was formed in 1974. It became incorporated as a company limited by guarantee in 2007 and a registered charity in 2011. These structural changes have not altered our mission – to ensure that our underground heritage is more widely understood and appreciated.

2) Reference and Administrative Details

The full name of Subterranea Britannica is often abbreviated to 'Sub Brit' in day to day activity. As well as registered charity, number 1141524, Subterranea Britannica is a not-for-profit company limited by guarantee, number 06447148. The charity's registered office is at Heathend Cottage, Windsor Road, Ascot SL5 7LQ.

As of 31 December 2019, the Trustees of Subterranea Britannica are:

(Company status indicated in brackets)

Martin Dixon (Director)

Linda Dixon (Director)

Tony Radstone (Director)

Paul Sowan (Director)

Bob Templeman (Director)

Tim Wellburn (Director)

Richard West (Director)

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Birmingham B1 2BR

3) Structure, Governance and Management

Subterranea Britannica's activities are organised and governed according to a Memorandum and Articles of Association. Management of the charity is vested in a committee that is elected at each annual general meeting. Any adult member of Subterranea Britannica may stand for election. The trustees of the charity (and directors of the company) are formed from the officers and established members of the committee. Many other members who are not on the committee play major roles in helping the charity to achieve its goals, under the guidance of the elected committee. The committee met three times in 2019 and maintains an active online dialogue, so many discussions are held and issues resolved outside formal meetings. Significant online decisions are ratified and minuted at the following committee meeting. Summaries of committee meetings are published for information to members.

The committee is also responsible for managing risk. Three major areas are routinely monitored:

- Health and Safety with regard to the potential hazards of underground space.

- Security of data held to ensure it is protected from unauthorised access and securely backed-up.

- Financial reserves of the charity.

Subterranea Britannica has no paid staff and relies on the generous donation of time and energy from many of its committed members. The committee always strives to ensure that Subterranea Britannica operates as cost-effectively as possible to maximise the benefit of subscriptions and donations.

4) Financial Review

The Trustees reviewed Subterranea Britannica's year-end reserves at their meeting on 8 February 2020. Our target is to have financial reserves equivalent to 6-18 months of annual incoming resources to cover any short-term reduction in membership income, to cope with unexpected costs (such as outsourcing activities currently done by volunteers), and to ensure that we have ready funds available for worthy projects. The current year-end reserves are above this band but the Committee is content with the position as we have a number of approved grants which have yet to be paid and in addition we have moved to a cash accounting basis so much of the additional money represents subscriptions paid in advance.

Membership numbers remain healthy and we ended the year with 1,054 paid-up members; this is a slight decrease on 2017 (1,070 members). We continue to benefit from the UK Government's Gift Aid scheme. None of the society's funds are restricted in their application across our charitable aims. A number of donations to qualifying projects were made during the year.

5) Objectives and Activities

The society's objectives are to advance education and science for the public benefit by the study, understanding, recording and (where practical) the preservation and protection of man-made and man-used underground structures, objects and spaces. The Trustees of Subterranea Britannica have complied with their duty under section 4 of the Charities Act 2006 in having due regard to the public benefit guidance published by the Charity Commission.

Key activities undertaken through the year include:

- Publication of three editions of our magazine *Subterranea*.

- Provision of the website www.subbrit.org.uk which had over 500,000 visitors.

- Major projects that delivered new platforms for both public and member websites.

- Use of social networking channels to reach over 10,000 subscribers.

- Compliance with GDPR (General Data Protection Regulations).

- Delivery of two full-day conferences in London and Reading.

- Study weekend based in Berlin.

- Arranging visits to underground sites across the UK.

- Involvement in and support for fieldwork to preserve underground sites

- Working with other bodies such as Local Authorities and the National Trust.

- Development and maintenance of links with other groups – particularly in mainland Europe – who share our interests and objectives.

- Responding to many enquiries from the public and professionals alike.

- Articles in the media, from local press to national television.

Subterranea Britannica invites applications for grant support, the Committee focusing on projects that provide public benefit. Grants approved in 2019 included those to fund access stairs In Williamson's Tunnels (Liverpool), a publication grant for a Civil Defence bunker (Gravesend) and protection of mineshafts (Grassington Moor). The Committee sees this funding as a vital part of our activity and we always seek to work with other groups as well as with statutory bodies.

The charity's publications, website and events are all open to the public and we strive to publicise conferences, in particular, to a wide audience. For reasons of insurance, many site visits are limited to Sub Brit members. Membership fees are set at a level that the committee believes is affordable and compare favourably with many similar charities.

6) Future Plans

Many current activities are seen as successful in their current form and will be continued into the future. The public website (www.subbrit.org.uk) represents our 'shop window' and it is planned to build on the new platform to extend our coverage of underground locations as a valuable resource to the general public and researchers.

In 2020 we plan weekend visits based in Oslo and Northampton. Other underground trips will include repeat visits to popular sites to maximise the number of attendees. Subterranea Britannica is keen to increase public awareness and appreciation of sites and we work in partnership with site owners, other charities and statutory authorities to record, sign and interpret underground sites. Our relationship with continental European groups is also important and we are represented on the International Union of Speleology 'Artificial Cavities' Commission.

What lies beneath our feet has played a vital part in the ascent of man.

On behalf of the Trustees

Martin Dixon, Chairman

NEWS

Miscellany compiled by Nick Catford

NEWS – ARCHAEOLOGY

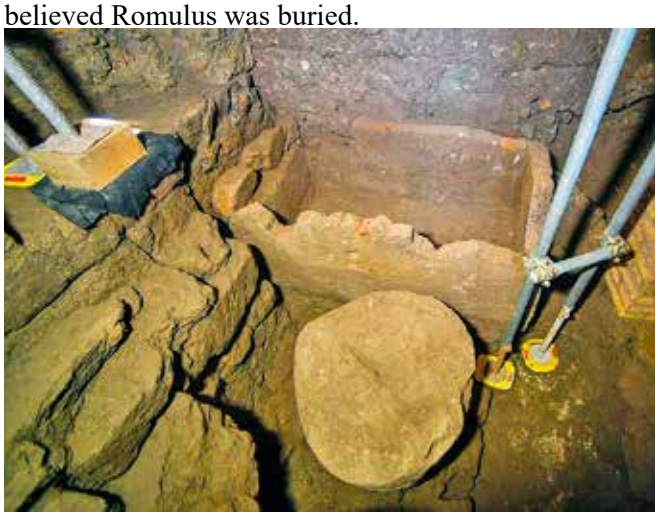
The possible tomb of Romulus, the founder of Rome, has been found

An ancient tomb believed to be the final resting place of the legendary 'wolf-suckled' Romulus – the founder of Rome – has been unveiled to the public for the first time in a series of new images. The tomb was uncovered in the Roman Forum during recent excavations and its discovery supports a long-standing theory that the founder of Rome was buried at the site.

Researchers from the Colosseum Archaeological Park investigated the claims and found a 4.6ft rock sarcophagus and circular altar that match descriptions from ancient scholars and Roman folklore. No bones were found at the site but some experts believe its existence is enough proof it was built as a shrine to Romulus. The finding is near another famous shrine in the Roman Forum, the Lapis Niger, which is an ancient black shrine.

But, unlike Lapis Niger, the proposed tomb of Romulus does not have any inscriptions to indicate who the person buried there was.

The underground temple is located below the entrance stairway to the Curia, a building that survives today and where Roman senators met to vote. Scholars believed that the temple's altar was positioned where ancient Romans believed Romulus was buried.



Legend has it that Romulus went on to establish the Roman senate and rule as the city's first king for nearly 40 years, before disappearing into thin air one day while out inspecting his troops. Stories of his death include his being torn limb from limb and his remains scattered around the city by jealous senators before being taken up to heaven by the god of war.

It is unknown if there was a body to be buried, and archaeologists think the newly-discovered tomb could be either a shrine to Romulus or his actual burial site.

SOURCE: *MailOnline,* 21 February 2020.

7,275 year old timber-lined well found in Czech Republic

An oak water well uncovered in the Czech Republic is the world's oldest wooden construction ever discovered. The well dates to 5,256 or 5,255 BC – the Neolithic period, or the end of the Stone Age – making it 7,275 years old. The structure has been dated using the internal rings of the wood, which are visible in cross sections. The sophisticated oak well has a square base area of about 30 inches by 30 inches, and is 4.5 ft in height. The object is unusual for the Neolithic period and shows that even people in ancient human settlements benefited from skilled carpenters.

The structure was discovered in 2018 during the construction of the D35 motorway near the town of Ostrov, Czech Republic. The wooden lining of the well was found at a depth of about 5 feet below the surface.

The well was preserved because it had been in waterlogged conditions underground for so long – if it had been left to dry out it would have been destroyed.

SOURCE: *MailOnline,* 3 February 2020.

NEWS – CONSERVATION AND HERITAGE

Crystal Palace's brick beauty set for £3m restoration

An architectural gem hidden under the streets of Crystal Palace is set to be restored to its former glory with a £3 million cash injection.

The Grade II listed Crystal Palace Subway is due to be revamped and opened as a cultural events space after Bromley Council gave the plans the green light. The cavernous Victorian structure, which features tunnel-shaped arched ceilings above a series of columns, is listed on Historic England's "heritage at risk" register.

The upgrade plans would allow the patterned brickwork and chequerboard flagstone floor of the 154-year-old subway to be on regular show once more. "Once the restoration is complete the subway is planned to become a new cultural destination for south London", a council report said.

The cash would come in the form of a £500,000 grant from Historic England, £2.34 million from the Mayor of

London's office and a further £296,000 earmarked from Transport for London, as the subway's stability is linked to Crystal Palace Parade above and the project would include strengthening works on the site.

The subway in 2015. Photo Nick Catford

The Friends of Crystal Palace Subway group is planning to contribute £5,000 to the project, after running a successful campaign to open the structure for volunteer-run open days since 2013. It says 22,000 people have visited during 15 open days in the past three years. (See *Subterranea* 36, August 2014, page 17.)

SOURCE: *Evening Standard*, 14 February 2020.

The Hundred Caves of Yoshimi, Japan

Yoshimi Hundred Caves is a cluster of late Kofun period tombs carved into a sandstone hillside, loosely resembling Cappadocia's underground city. Designated as a National Historic Monument in 1923, it's the largest grave cluster in Japan, with 219 burial caves known today despite its name.

The Hundred Caves were first excavated in 1887 by Shogoro Tsuboi, the first anthropologist in Japan and pioneer of Japanese archaeology. He proposed a theory that the caves were inhabited by the Koro-pok-guru, a race of diminutive people in the folklore of Ainu people, but it was refuted in the following decades.

The purpose of the mysterious and uneven caves is still uncertain, as some of the walls are covered with old graffiti. Near the end of World War II, about one-tenth of the complex was destroyed to make space for a military aircraft engine factory. This tunnel goes on for about 0.8 miles, stretching towards the nearby ruins of Matsuyama Castle.

Another attraction found within the site is Schistostega moss or goblin gold (*hikarigoke*), which is quite rare and known for its luminescent glow. The cave complex was designated as one of the few Natural Monuments of Japan in 1928.

The site is partially open to the public today, including many of the caves, part of the factory tunnel, and two small-scale museums. One exhibits artifacts recovered from the tombs, while the other displays a miniature diorama of Matsuyama Castle as it once looked during its heyday.

SOURCE: *Atlas Obscura*, March 2020.

Plans to convert Inverness emergency centre into a museum

Plans have been lodged to convert part of a Second World War bunker in Inverness into a thriving community museum. The two-storey sunken rectangular building was one of three separate bunkers that composed the original sector operations centre at Raigmore.

Following the succession of major civil disasters including Piper Alpha, the government decided all local authorities should have emergency plans in place to deal with civil protection – leading to the transformation of the category-B listed bunker in 1988 into an emergency centre for the north.

The Operations Room in 2001. Photo Nick Catford

The filter block is the only remaining structure left on the site following demolition works in 2002. In an effort to showcase the rich history of the base on Raigmore Hill, developer CPS Partnership aims to transform the lower floor into a museum, offering small groups of up to 10 people the chance to embrace the heritage of the city centre structure.

Developers are eager to convert the lower floor into exhibition space, focusing on four main areas. These include World War II and the radar flight block, the civil defence era – covering the 1950s to 60s and perhaps the early 80s – the Cold War Era, explaining why the bunker was renovated, and the 'emergency bunker era'.

Alongside the museum, plans have also been outlined to reuse the emergency centre telecommunications areas as a small data-centre, providing vital internet connections to local businesses. Around four or five vacant rooms will also be put up for long-term rental or lease to help generate funds to keep the business venture afloat.

SOURCE: *The Press and Journal,* 16 December 2019.

Appeal against refusal of planning permission to demolish air-raid shelter cluster dismissed

A few years ago Sub Brit financially supported the Friends of Halstead Air Raid Shelters in Essex who were trying to preserve a unique group of shelters built for workers at the Courtaulds factory in the town.

The local council refused permission to develop the site and the developer appealed. We are pleased to report the planning inspectorate dismissed the appeal on the land and upheld the refusal of planning permission to build 73 dwellings, comprising 32 houses and 51 apartments on the site.

Photo Chris Rayner

The site is within a conservation area (CA) and in coming to their decision the Planning Inspectorate stated "The significance of this part of the CA is derived from the interesting and historic architecture and uses of buildings within and around the town centre. These portray the evolution of this settlement and include buildings associated with industrial activity in the 19th century.

"In addition to the above, the site also accommodates 15 World War II Air Raid Shelters (ARS). Eight of these fall within the boundary of the CA and also appear to fall within the curtilage of listed buildings at Factory Lane East. These are therefore designated heritage assets."

This decision was reached thanks to the many organisations (including Sub Brit) and experts who submitted statements to Braintree District Council and the Planning Inspectorate.

SOURCE: *Braintree District Council Appeal Decision*, 9 December 2019.

Welsh slate landscape nominated for World Heritage status

A landscape in Wales which once provided a third of all slate used for buildings across the globe has been nominated for World Heritage status. The so-called Slate Landscape of Snowdonia could be ranked alongside other UNESCO sites such as Stonehenge, the Grand Canyon and the Great Wall of China.

The slate mines and quarries of the area 'roofed the world' in the 18th and 19th centuries. Slate has been quarried in North Wales for more than 1,800 years but it was not until the Industrial Revolution that demand surged. By the 1890s around 17,000 people were employed in the industry, mining 485,000 tons of slate a year.

The landscape includes seven quarries and mines around communities such as Blaenau Ffestiniog and Bethesda. Some quarries still operate. If successful, the Slate Landscape will become the UK's 33rd UNESCO World Heritage Site, and the fourth in Wales. The site will be reviewed by experts before being considered at a UNESCO committee meeting in 2021.

SOURCE: *MailOnline,* 24 January 2020.

Plans for the restoration of Barnton Quarry ROTOR bunker progressing well

The transformation of a derelict nuclear bunker into a visitor attraction and conference centre could be on the way after plans were submitted to Edinburgh City Council. The Barnton Quarry Nuclear Bunker is owned by Scotcrown Ltd, run by Sub Brit member James Mitchell who also owns Scotland's Secret Nuclear Bunker at Anstruther.

The plans follow a devastating blaze in 1993 when the building was set alight before years of gradual restoration work. The proposals, which include turning some of the space within the bunker into conference facilities for the building on the surface, could see 100,000 people visit the attraction once open.

Overall, the bunker is more than 30,000 sq ft in size, similar to a large supermarket, and would have been a Cold War safe haven for government ministers, members of the military, the police, fire and ambulance services, as well as BBC staff and telecommunications engineers.

The plans state: "Scotcrown's aspirations for the site has always been the restoration of the bunker into an authentic, historically accurate representation of the functioning bunker. To this end it has been a gradual labour of love for many years now, with the growing involvement of enthusiasts and the local community. It is fully envisaged that this relationship and involvement will continue to prosper and develop into the future. Our brief has been to crystallise the remainder of the exercise into the formal construction project required to deliver the finished article and to deliver the formal consent required to operate a viable and prosperous business into the future."

The design statement adds, "The vandalism that preceded Scotcrown's acquisition of this unique slice of Edinburgh's more recent history is well on the way to being rectified – this proposal seeks to secure a viable future to ensure that good work is built upon and the complex maintained for the benefit and interest of future generations."

The site, which lies east of Clermiston Road North, is located within the south quarry of Barnton quarry and surrounded by woodland. The bunker was commissioned in 1956 during the Cold War after the original building was constructed at the end of the Second World War, and was operational until 1982.

After being sold to a private owner it was stripped of all its original contents and filled with illegally dumped rubbish, before the fire in 1993 led to the total destruction of internal features. However the fabric of the building was left largely undamaged and is now the only such bunker in its original format anywhere in the world.

The plans state: "Since being acquired by Scotcrown in a derelict state, painstaking efforts have been ongoing to restore the building to its original form and reinstate authentic contents. This includes the salvaging of much of the original ventilation system which has all required thorough shot-blasting to rescue it." The plans include the construction of stair lifts to allow disabled access.

SOURCE: *Edinburgh Evening News,* 11 March 2020.

WWII bunker in Tokyo opens to the public

Japan's Defense Ministry plans to open a wartime underground bunker in Tokyo to the public. The bunker was built by the now-defunct Imperial Japanese Army as its general headquarters during World War Two to prepare for air raids. It is located on what is now the ministry premises in the Tokyo district of Ichigaya.

The facility had been shown to the public on a limited basis after the war. But it was closed after its interior began to deteriorate, raising concerns about its ability to withstand earthquakes. The ministry has decided to reopen it now that quake-proofing work has been completed.

Reporters examine the bunker during a special press open day in August 2015

The shelter is located about 15 meters underground and covered in about a meter of concrete. It consists of three tunnels and has an area of about 1,300 square meters. A ministry record suggests that about 200 people could inhabit the shelter. A vent to the surface is connected to a stone lantern to conceal it.

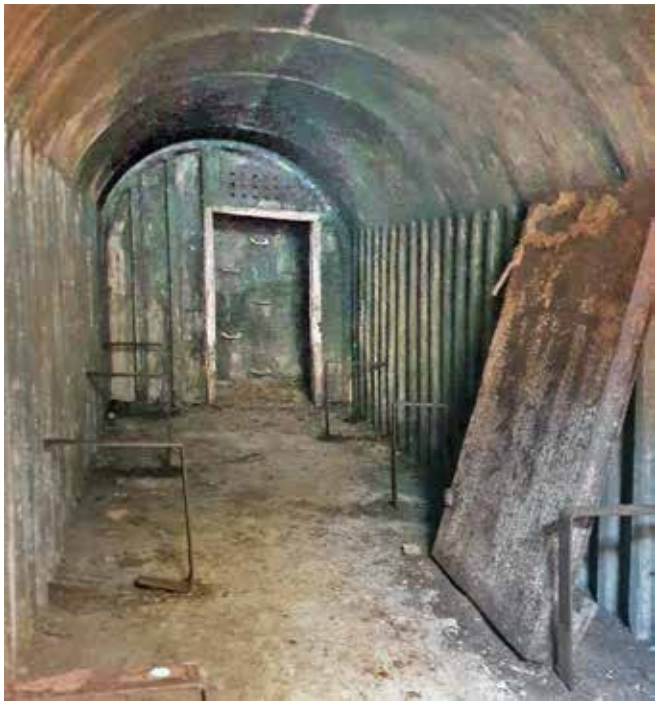
The ministry initially planned to open the facility on 1 April 2020. But it now plans to decide the date based on developments surrounding the spread of coronavirus.

SOURCE: *NHK World, Japan,* 14 March 2020.

NEWS – MILITARY AND DEFENCE

Engineers uncover forgotten air-raid shelter in west London

One of the best-preserved air-raid shelters found in London has been uncovered in Hammersmith by engineers tackling water leaks. Sealed up and forgotten for more than 75 years, the reinforced concrete bunker – seven metres long and two metres wide – would have been large and strong enough to protect several families from bombing raids during the Second World War.



The structure was in good condition and a metal door was propped up against a wall. Dave Axon was one of the Thames Water engineers who found the bunker, at the bottom of Standish Road, next to the A4, as his team was attempting to install leak-detection equipment on a 30-inch trunk main.

"Normally they're full of water, or rubbish, or vandalised, but an archaeologist said this was like opening the door into a brand-new one," he said.

It is thought the shelter may have belonged to Beavor House, which once stood in nearby St Peter's Road, or the Metropolitan Water Board which ran Hammersmith Pumping Station opposite. The shelter has now been sealed up on the advice of Greater London Archaeology Advisory Service.

SOURCE: *Evening Standard*, 29 November 2019.

Investigation of tunnels under Primark store in Broadstairs, Kent

Workers have moved in on the site where historic tunnels were discovered five years ago. A team, with heavy machinery, have been working outside Westwood Cross Primark in Broadstairs.

It is understood that more holes have opened up leading to vast, mysterious tunnels which lay under the budget store. When they were first discovered back in 2015, Primark was forced to close. But on this occasion, the store remained open. Though nobody knows what the purpose of the tunnels was, they are believed to be more than 100 years old.

Photo Frank Leppard

In the Second World War, Thanet was subject to a number of German air raids and residents would seek shelter from the bombs underground. A Freedom of Information request submitted to the MoD however could not shed light on the exact purpose of the tunnels.

SOURCE: *KentLive,* 16 March 2020.

Permission granted for development of former MI6 bunker, London

Studio RHE has won planning permission to convert a 1.5-acre underground bunker which is said to have been used by spies into workspace for the creative industries. The 58,000sq ft scheme will be created beneath Allies & Morrison's 37-storey Keybridge apartment building near Vauxhall gyratory. Built on the site of a 15-storey brutalist BT telephone exchange on South Lambeth Road, this is set to be the UK's tallest residential brick tower when it completes. It will contain 260 flats.

There are unconfirmed rumours that the old 1975 Keybridge House – which was itself built on the site of a former fishpaste factory – was once used by spooks who arrived through a secret tunnel from the MI6 headquarters which is a few hundred yards away.

Artist's impression of the new Storybox lobby

Developer General Projects appointed Studio RHE to create Storybox in the 5m-high single-storey basement which it describes as an adaptable subterranean environment. It envisages occupiers might use it for pod hotels, labs or gaming experiences.

Artist Tom Price has been commissioned to deliver a series of embedded sculptures surrounding the project, while there will also be ground-level cafes and installations. Work was set to start on site immediately and to be complete by the summer.

SOURCE: *Building Design,* 11 March 2020.

WWII air-raid shelter discovered under café in St Helens, Lancs

An air-raid shelter used during the Second World War has been uncovered in St Helens, Lancs.

Momo's, a community café located on Westfield Street opposite the town's iconic Beecham's building, is the site of the shelter, which connects the two buildings through a series of tunnels located below the eatery. The shelter was used by the residents of St Helens as one of the central safe points in the area during World War II.

1940s chair as used in Beecham's factory

Owner Claire Rigby was hesitant at first about opening the shelter and waited 12 months to finally peek inside. She said, "The landlord

told us about the shelter when we were doing the place up. He said 'behind that wall is the air-raid shelter.' I've got a friend who's a very curious guy and it's taken him from June last year to last month to finally persuade me to put a hole in the wall and put our heads through."

With the help of her customers, the 39-year-old history enthusiast was able to discover and date relics back to as early as 1915. Once the shelter is cleared and funded, Ms Rigby hopes to eventually open it up as a museum where schoolchildren can enjoy history lessons inside a real wartime shelter.

SOURCE: *Liverpool Life,* 10 March 2020.

Plans for Lidl supermarket close to atomic warhead factory could be scuppered.

Plans for a Lidl supermarket just 600 yards from an atomic warhead factory are set to be blocked over fears shoppers won't be able to get out if there is a nuclear disaster. The budget supermarket wants to build the store close to the Atomic Weapons Establishment, in Tadley, Hampshire, but the plans have been held up for three months over safety fears.

It was first mooted in December but the planning decision over whether to give it the green light was delayed in January and then again in early March. If it does go ahead, Lidl would have to build a bunker and provide staff with specialist training to cope with a nuclear fall-out. There are fears about how quickly customers could be evacuated from the possible superstore in case of a disaster happening at the facility.

The council is still not convinced there is an acceptable emergency evacuation plan in the event of a serious incident at AWE. The safety of the pubic is paramount because the planned supermarket would be so close. West Berkshire Council is now set to discuss the planning application in May.

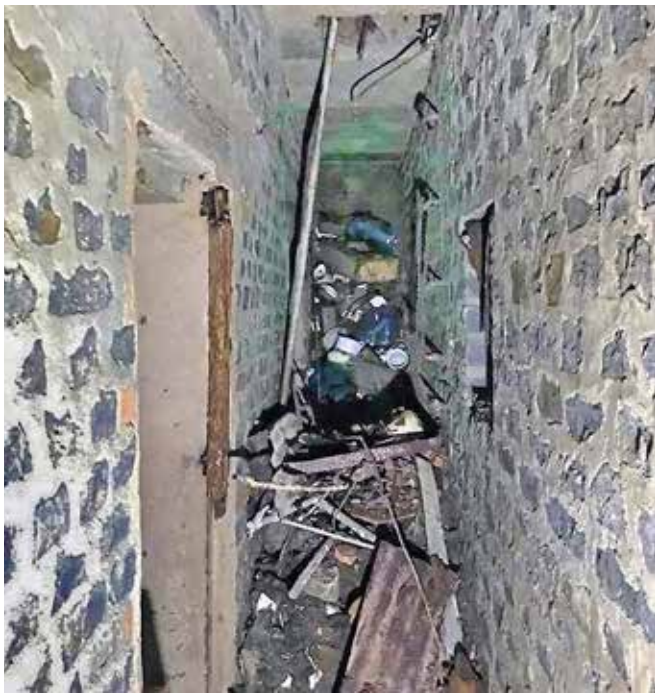
The AWE site produces warheads for the UK's Trident nuclear deterrent and also has to maintain the capacity to be able to design a new weapon, if it was ever required. The AWE is also responsible for Trident's design and support, as well as getting rid of redundant warheads

Scientists at the AWE were also involved in testing for radioactive poisoning in the case of Russian defector Alexander Litvinenko, who died in 2006 after being poisoned with polonium.

SOURCE: *MailOnline,* 9 March 2020.

Previously unknown Nazi command centre found on Guernsey

A surprised nursery teacher found a German command bunker buried near their school complete with graffiti from the Nazi occupation. Christine Le Huray was out with pupils in a garden near the Monkey Puzzle School on Guernsey when she discovered a hole under a bench. She thought it was nothing and tried to cover it with stones, but they kept disappearing and the hole got bigger. Experts from Festung Guernsey, a World War II fortification initiative, were called in to investigate the hole in the grounds of Les Cotils hotel, and it turned out to be the entrance to a hidden German command bunker built during the Nazi occupation of the island.



The corridor

Having ventilated the bunker, Festung Guernsey discovered a network of four rooms connected by a long corridor lined with granite setts. They describe it as a unique find, because it's not mentioned in any German documents at all. Bunkers are known to have been placed on high ground in St Peter Port as a German line of defence.

This discovery is believed to be a command bunker which would have been used to receive communications. There are numerous interesting features that made the bunker even more unique, such as small recesses in the walls, and names inscribed in the concrete.

The site has now been secured to prevent further collapse. Festung Guernsey are in discussion with officials to see if they can open it up again.

SOURCE: *Metro,* 6 March 2020.

Auxiliary Units bunker discovered in Scotland

An Auxiliary bunker built during the Second World War has been discovered during deforestation work in southern Scotland. These bunkers were supposed to have been destroyed after the war, but many were simply left to decay

instead. The entrance was discovered during harvesting operations, and was subsequently surveyed by AOC Archaeology on behalf of Forestry and Land Scotland.

The bunker appears to have been built to the standard design, with a central area measuring 7m by 3m formed by riveted corrugated iron sheets over a cement floor. The main chamber was entered through a narrow passage to the east, which leads to an access hatch, while a second escape hatch, at the other end, has now been filled in. The ends of the bunker are brick-built, with poured cement roof caps, and are divided from the main area by a 'blast wall' intended to protect against grenades. Ventilation pipes, 32cm in diameter, are found at either end of the structure.

Very little of the bunker's internal furnishings survive, but broken timbers found on the floor are thought to have perhaps been the remains of the original wooden bed frames. An empty tin can represents another link to the last people to occupy the structure.

The bunker was buried c.1.3m beneath the current ground surface at its deepest point, but the sloping nature of the terrain means that it is only 0.7m below the ground at the entrance. The structure was surveyed using 3D laser-scanning, as well as comprehensive photography, and a written record of the site was created. After the survey was complete, a grill was installed over the entrance, with bat boxes built inside, to secure the bunker.

SOURCE: *Current Archaeology,* 13 February 2020.

Villagers may have to evacuate for 10 years while munitions store is cleared

Residents of a village in the Swiss Alps may have to evacuate their homes for more than a decade while a massive underground munitions store from World War II is cleared. The Swiss Army depot in Mitholz, about 35 miles south of the capital Bern, contains 3,500 tonnes of ammunition and several hundred tonnes of explosives.

Nine people died there in 1947 when around half of the arsenal exploded and the Swiss defence ministry now fears a second tragedy. Experts said the risk of a second explosion had been underestimated for decades and that the risk is now "unacceptable" and total evacuation was the best option.

The underground store has partially caved in and many of the explosives are now covered by fallen rocks. The

cost of cleaning up the site is expected to significantly exceed £790m and will take until at least 2031.

The village's 170 inhabitants are being asked whether they would prefer to evacuate for a decade and return after the work is done or be given assistance to relocate permanently. Either way, the idyllic mountain village will become a ghost town for years. Many of the families have lived in the village for generations.

Before work could start a major road passing through the village – a collection of chalet-style homes – would have to be rerouted and a railway line would have to be covered. If the evacuation creates insurmountable problems, it would still be possible to significantly reduce the risks by covering the depot with rock.

SOURCE: *MailOnline,* 27 February 2020.

NEWS – MINES AND MINING

Sirius Minerals wins £405m rescue deal

A rescue deal has been agreed for Yorkshire-based Sirius Minerals, whose Woodsmith fertiliser mine is set to create more than 1,000 jobs. Shareholders backed a £405m bid from Anglo American for the cash-strapped company, which said it faced falling into administration without the deal.

Sirius said the outcome had secured jobs and future benefit for the local community and wider region. The project will be UK's first major deep mine in 40 years.

Shareholders who attended the meeting at the Honourable Artillery Company in the City of London were told if they did not support the deal, the company would collapse.

They were being asked to vote in favour of Anglo's 5.5p per share offer, despite some paying as much as 25p a share when the company was growing.

Shareholders, a large proportion of whom are small individual investors rather than big institutions, stood to lose out heavily. Some 85,000 small shareholders are thought to have invested in the project, alongside several large institutional investors.

The positive outcome from the meeting secures a return for shareholders, and provides greater certainty in terms of safeguarding the project, protecting the jobs and allowing the community, region and the UK to continue to benefit from the project.

The mine, currently under construction, includes a minehead at Dove's Nest Farm, Sneaton, North Yorkshire.

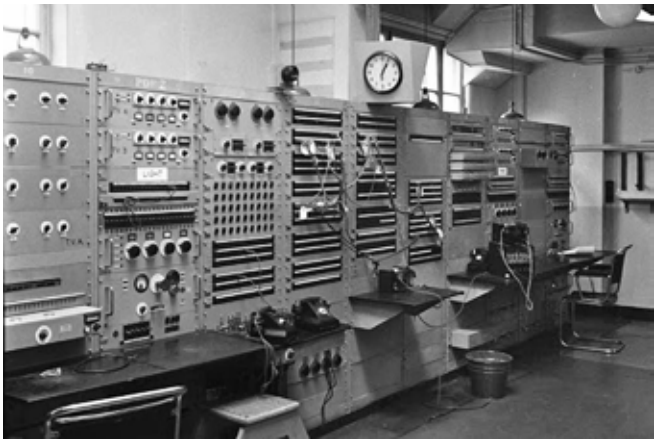
SOURCE: *BBC News,* 4 March 2020.

NEWS – MISCELLANEOUS

BBC plans to broadcast from wartime bunker if coronavirus hits studios

BBC executives have drawn up plans after a crunch meeting of its Gold committee to thrash out contingency arrangements in case major corporation hubs, such as the £1billion New Broadcasting House in London, are affected. Emergency plans include switching some operations to Wood Norton in Worcestershire, home to its College of Technology, part of the wider BBC Academy.

The BBC bought the site near Evesham in 1939 so it could move operations away from London if needed. During the Cold War it was earmarked as a broadcasting centre in the event of a nuclear attack. The site includes a country hotel.



Wood Norton's control room during WWII

Visitors to Wood Norton are now being limited to keep the facility clean and prevent the risk of its becoming infected, according to a source. London-based workers rely heavily on public transport, where the threat of contracting the disease is deemed greater. But Wood Norton has no public transport links, meaning it is easier to keep the site free of the virus.

The source said staff already based at Wood Norton have the skills and capacity to do what London control rooms do. The steps the BBC is taking to ensure it can continue to function during this outbreak simply underlines the immense value the BBC provides to the public and the dedication of the staff who serve us all.

SOURCE: *Daily Mirror,* 11 March 2020.

Caving Supplies business for sale

Phil Brown has put the Caving Supplies shop and business in Buxton, Derbyshire, up for sale. He and Chandra want to retire and spend more time on their other interests, hobbies and family.

Phil established Caving Supplies in 1972 in London, moving to London Road, Buxton in 1976. Many Sub Brit members will have purchased their kit from Caving Supplies. Keep a look at their web site for some exceptional bargains: www.caving-supplies.co.uk

SOURCE: *Below – Journal of Shropshire Caving and Mining Club,* Spring 2020.

World's largest cave fish discovered in India

Likely a new species still in the process of evolving and losing its eyes, the Indian animal is 10 times heavier than any known cave fish.

About 250 species of subterranean fish are known on Earth, eking out a living in a world of permanent dark and scant food. They are usually small, generally a few inches long, since there's usually little food or prey to eat.

But in an underground chamber in northeastern India, researchers have discovered a cave fish that is much bigger—growing to nearly a foot and half in length and weighing about 10 times more than any known species.

The fish, described recently in the journal Cave and Karst Science, may still be in the process of evolving to be a separate new species, says Harries, a study co-author

and could present scientists with a unique opportunity to understand this evolutionary process.

The finding raises many questions, such as how the fish maintain their body size, what they feed on, and how they've adapted to live in these caves, which are extremely extensive and deep, many of which haven't yet been explored. Like most other troglobites, the creature is basically blind and eyeless, though it apparently has some ability to sense light.

SOURCE: *National Geographic* 12 February 2020

Huge drug-smuggling tunnel found on US/Mexican border

US officials say they have discovered the longest smuggling tunnel ever found on the border with Mexico. Stretching for 4,309ft the tunnel had a lift, rail track, drainage and air ventilation systems, and high-voltage electrical cables. The passageway connected an industrial site in the Mexican city of Tijuana to the San Diego area in California.

There were no arrests made or drugs found. Authorities did not say who they suspected of being behind the tunnel. But Mexico's Sinaloa cartel, described by the US government as one of the largest drug-trafficking organisations in the world, operates in the area. Its founder and long-time leader, Joaquin 'El Chapo' Guzman, is serving life in prison in the US.

The tunnel was discovered in August. Mexican officials identified its entrance and US investigators mapped it, before releasing the findings in January. It has an average depth of 70ft below the surface, with the tunnel being 5.5ft high and 2ft wide, US Customs and Border Protection said. It was not clear how long it took to build it.

The sophistication and length of this particular tunnel demonstrates the time-consuming efforts transnational criminal organisations will undertake to facilitate cross-border smuggling. Several hundred sandbags were discovered blocking a suspected former exit of the tunnel in San Diego's Otay Mesa industrial warehouse area, the statement added. The main tunnel had an incomplete offshoot.

More than a dozen sophisticated tunnels have been found on California's border with Mexico since 2016. The second-longest tunnel in the US, found in San Diego in 2014, was 2,966ft long.

SOURCE: *BBC News,* 30 January 2020.

Underground illegal cigarette factory discovered in Spain

Six workers trapped in squalid, airless conditions were rescued from an elaborate cannabis farm and counterfeit tobacco factory hidden beneath a mountain village in Spain after police arrested the suspected masterminds of the operation. Spanish police smashed a British-led gang behind Europe's first-ever underground illegal cigarette factory.

The secret operation, complete with machinery that could produce up to 3,500 cigarettes an hour, was hidden in a maze of tunnels accessible only through a trapdoor covered with hay in a stable block. One of the suspected ringleaders was a British fugitive who failed to return to his UK prison cell after a temporary release. Daniel Dobbs, 31, was allegedly part of the gang behind the operation, which Europol said generated more than half a million pounds in criminal profits per week.

Inside the bunker Spanish police found a large machine for making cigarettes alongside a kitchen, bathroom and bedroom for those living there

The National Crime Agency (NCA) tracked him down to Spain, where he was living under a false name and he was arrested as the Spanish Civil Guard smashed an organised crime group last week. He was held alongside 19 other people, including other Britons, as police seized more than three million cigarettes, along with 20kg of hashish, 144kg of marijuana, three weapons, and GPS tracking and jamming devices. Dobbs will be returned to the UK once the Spanish investigation and any judicial proceedings have ended.

The factory is located in Monda, Malaga, just a short drive from Marbella. The number of Brits arrested has not yet been made public, although police say the criminal gang behind the illegal cigarette factory was formed mainly by British nationals.

SOURCE: *MailOnline,* 21 February 2020.

Arctic doomsday vault receives seeds from Prince Charles

A "doomsday vault" nestled deep in the Arctic received 60,000 new seed samples in late February, including Prince Charles' cowslips and Cherokee sacred corn, increasing stocks of the world's agricultural bounty in case of global catastrophe.

Mounting concern over climate change and species loss is driving groups worldwide to add their seeds to

the collection inside a mountain near Longyearbyen on Spitsbergen in Norway's Svalbard archipelago, about 800 miles from the North Pole. (See *Subterranea* 29, April 2012, page 76.)

The "Noah's Ark" of food crops is set up to preserve plants that can feed a growing population facing climate change. As the pace of climate change and biodiversity loss increases, there is new urgency surrounding efforts to save food crops at risk of extinction. The large scope of today's seed deposit reflects worldwide concern about the impacts of climate change and biodiversity loss on food production.

A total of 36 regional and international institutions have contributed to the 60,000 samples that were deposited in February. The new arrivals include staple crops such as wheat and rice, as well as wild varieties of European apple trees. Prince Charles, who is known for his environmental advocacy, sent the seeds of 27 wild plants, including cowslips and orchids collected from the meadows of Highgrove, his country home.

"It has proved to be an exhausting and often demoralising task to persuade people of the utterly essential role played by all this diversity in maintaining vibrant, healthy ecosystems that sustain both people and our planet," the Prince of Wales said in a statement.

The latest shipment will bring the number of seed varieties, stored in three underground alcoves at an optimum minus 18 degrees centigrade to 1.05 million. The seed bank has the capacity to hold up to 4.5 million samples.

SOURCE: *Science Alert,* 26 February 2020.

Maintenance drones used on the Tokyo Metro

Maintenance workers in the bowels of the Tokyo Metro system are being assisted by remote-controlled 8.5-inch wide drones. The remote-controlled 2.5 pound drone is encased in a plastic sphere to protect it from any unfortunate bumps and knocks while navigating the labyrinth.

Cameras on the custom-built drone will allow operators to scan hard to reach parts of the tunnel network for signs of damage. Tokyo Metro runs 85 percent of the sprawling subway network of the nation's capital city and is using the drones to inspect upper regions of the tunnels. The drones are small and easy to control and their inspections do not require the time-consuming and expensive erection of platforms and scaffolding. They can also get closer to the walls to search for signs of deterioration that a human being cannot see.

A Tokyo Metro drone was first launched on February 6 on the Hanzomon Line and there are plans to roll out drone inspections to all the system's nine lines in future. The drone can fly for up to five minutes continuously at a distance of up to 164 feet from the operator. In a demonstration, an employee flew a drone through a training tunnel and used on-board cameras to capture images of areas near the ceiling and vents.

SOURCE: *MailOnline,* 5 March 2020.

New fan at disused City Road tube station could heat 1350 homes

More than 1,000 homes in north London are being warmed by the hot air produced in the city's notoriously sweltering underground tunnels.

The remains of City Road station have been transformed to house a huge underground fan which extracts warm air from the Northern line tunnels below. A six-storey shaft funnels the warm air over pipes and the hot water is then pumped to the local energy centre from where it eventually reaches 1,350 homes, a school and two leisure centres in nearby Islington. Council tenants connected to the system will save around ten percent on their energy bills.

City Road station in 1915, seven years before closure

The station was abandoned due to low usage in 1922, but modern trains fly through it between Old Street and

Angel. During the winter months, a fan in the ventilation shaft extracts warm air from the Tube. This travels over a series of water-filled pipes, heating the water inside by a few degrees.

The water temperature is then increased to about 80 degrees C using heat pumps, which is suitable for domestic and commercial central heating systems. The fan also has the potential to operate in reverse to supply cooler air to the Tube tunnels during the summer months.

The hot water is pumped around a network of insulated underground pipes, and the heat is again transferred to communal heating system loops on housing estates using heat exchangers.

Currently, there are projects throughout the country using waste energy from disused mine shafts, power plants and factories, to heat up homes and businesses. There is enough energy wasted in London to cover 38 percent of its heating needs, according to Greater London Authority.

SOURCE: *MailOnline,* 5 March 2020.

Moldova underground wine store houses collections of Hermann Göring and Vladimir Putin

Cricova takes the notion of a 'wine city' to another level, in more ways than one. About 260 ft below this little-known Moldovan town, over 75 miles of limestone caves are home to about 1.3 million bottles of wine.

The fertile region surrounding the town of Cricova had no problem becoming a major source of wine for the USSR by the mid-1900s. They did have a problem storing all of it, however.

Conveniently, the excavation of vast amounts of limestone to build the nearby capital of Chisinau left a sprawling underground network of cool, dry caves, ideal for ageing and storing wine. As more limestone was mined to build the city, more space was created underground to host an imperial collection of bottled wine. After Mileştii Mici, another vast underground Moldovan winery, Cricova is the second-largest wine cellar on the planet.

Today, the above-ground winery is a jack of all trades, producing more than 150 styles, including basics such as muscat, pinot noir, cabernet, and sauvignon blanc, but also unique local varieties such as rkatsiteli and aligote. The 'streets' and 'avenues' that make up the underground booze-storage metropolis are named for the wines they store, helping tour guides navigate visitors through the network by mini-train.

The winery is most famous for producing a sparkling variety known as kodrinskoie, utilizing methods made famous by French monk Dom Pierre Pérignon. According to *Balkan Insight*, a team of five women rotates as many as 35,000 bottles of the sparkling vino 45 degrees in wooden slots to encourage the movement of sediments. The site was made a visiting point for all official delegations to the USSR and, even after its collapse, the cellars still hold the collections of various present-day political heavyweights. Angela Merkel, John Kerry, Joe Biden and Petro Poroshenko all visited and were gifted private collection spaces. Vladimir Putin has an impressive assortment of wines here, and a gold-plated mini-car to take him through the tunnels. While no politician, the first man in space, Yuri Gagarin, is rumoured to have been lost in the caves for hours

Perhaps most shockingly, the wine collection of Hermann Göring, one of Hitler's henchmen, rests here, as well. After the Red Guard took Berlin, his collection of more than 2,000 bottles from regions occupied by Germany during World War II were brought here to continue ageing.

After each tour, visitors can sample an array of wines in one of the facility's five extravagant tasting rooms.

SOURCE: *Atlas Obscura,* March 2020.

Saint Margaret's Well, Binsey, Oxfordshire

In the famous Chapter VII of *Alice's Adventures in Wonderland*, titled "A Mad Tea Party," the Dormouse tells a story of three daughters who lived at the bottom of a treacle well. Like many other things in Carroll's book, the inspiration behind this chapter can be found in Oxford, in the village of Binsey.

Dating back to the 12th century, the parish church of Saint Margaret is famed for the holy well that sits outside its west end. Known as St Margaret's Well, it was dedicated to Saint Frideswide, the patron saint of Oxford. According to legend, during the 7th century, Prince Algar of Mercia was going to force her into marriage.

To escape this fate, Frideswide fled to Binsey. While out searching for his bride-to-be, Algar was blinded by a lightning bolt. Frideswide prayed to God and it brought forth a spring, whose waters had healing powers and cured the prince's blindness.

In the literary giant, Lewis Carroll describes the well as a "treacle well". During the medieval period, the word "treacle" meant "healing fluid". The well became a focus for pilgrimages during the Middle Ages, though it's rather obscure and mostly forgotten today. If you're a fan of the classic tale, you can't miss this place on your pilgrimage to Oxford.

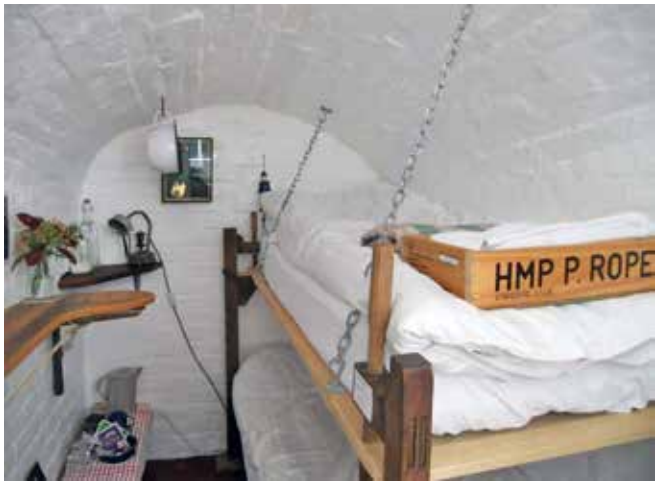
SOURCE: *Atlas Obscura* , March 2020.

Quirky prison-themed bedchamber in cellar of Margate guesthouse

Have you ever wondered what it's like to spend a night in prison, but don't fancy breaking the law to find out? Would you believe us if we told you there was a cell where prisoners can stay the night, but leave in the morning with no repercussions?

Penny Rope is a prison-themed bedchamber built into the former cold store of a Grade II-listed Georgian property in Margate in Kent, where visitors take on the role of prisoners in this completely quirky, totally unique key. Penny Rope offers a perfect base from which to explore this iconic seaside town, while also creating an experience guests will remember for a lifetime.

Painstakingly transformed by owners Polly and Clare, there is thought behind every detail of Penny Rope to create a sense of imprisonment, from the tin mugs for your morning tea or coffee to the coat hangers marked 'Useless'. Even the name has been taken from the Victorian tuppenny rope that London's poorest would pay to sleep over, for want of a bed.



However, despite these seemingly austere details, there is no lack of comfort for the prisoners. The bunks are dressed in white cotton linen, with thick, cosy duvets and blankets; hot water bottles provide extra warmth on chilly nights, and a heater keeps the cell cosy if needed. With indoor lighting, you decide when it's 'lights out' and plug sockets and free Wi-Fi mean you don't lose all your communication rights!

Guests have the use of their own private shower and toilet in an outbuilding in the private walled garden, and even this has received the artistic genius of Polly and Clare – although we won't give too much away. Half the enjoyment of a stay at Penny Rope lies in spotting another clever detail, another ironic witticism, all of which add to the unique character of this place.

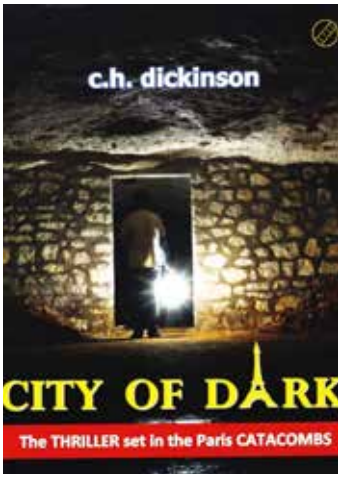
SOURCE: *Host Unusual,* March 2020.

NEWS – PUBLICATIONS

Below the City of Light, the City of Dark

DICKINSON, C. H., 2019, ***City of Dark,*** self-published, 413pp [ISBN 978-1-072133-21-6]

Book review by Martin Dixon



Sub Brit members more than most will appreciate that the Catacombs in Paris are merely a small part – perhaps one percent – of a much wider underground network. This network, properly known as the GRS (*Grand Réseau Sud* or Great Southern Network) is composed of many separate quarries, connected and consolidated by the Inspection Générale des Carrières (IGC) from the 18th century onwards. This amazing network is officially out-of-bounds to the public but nevertheless frequented by a large group of self-styled 'cataphiles'.

Claire Dickinson has written an intriguing novel where this larger network is the seat of a terrorist threat to the city above. The investigations are led by Inspector Khalid Sadiqi of the counter-terrorism squad who, in order to understand the subterranean network, engages the help of Toni Corrigan – a postgraduate student and passionate cataphile who has unfettered access to the GRS from beneath her college.

The story develops shaped by realistic glimpses of French history, politics and bureaucracy; tension builds as the chase progresses. The plotline that sees Sadiqi teaming up with Toni rather than enlisting the support of the IGC or the dedicated quarry police (*cataflics*) wasn't convincing to me but the subsequent interactions between two very different personalities add to the intrigue.

Having personally explored parts of the network where the action takes place, I can attest to the realism with which the tunnels are described. In real life, Claire has a Doctorate from the Pantheon-Sorbonne University in Paris and I'm sure her own infra-mural studies included underground exploration of this fascinating city. The book helpfully includes both surface and subterranean maps covering where the main action takes place and this is particularly useful for those who do not know Paris.

On the minus side, the volume would have benefited from tighter proofreading. Some of the typos wouldn't have been caught by a spell checker (eg canon fodder, hoards instead of hordes) whereas others certainly would (Algeia, bulevard, handbreak …). Capitalisation of words such as President and Prime Minister is also a little random. The text uses American spellings throughout but no doubt Claire would make her Canadian citizenship the center of her defense.

St John the Baptist is cited as the Patron Saint of miners whereas in reality St Barbara is accorded this honour. The story also includes references to freemasons and the symbolism that underground and dark space has for their brotherhood; others will have to comment on the realism of this part of the plot. Elements of the final chase have touches of Indiana Jones about them but it is a thriller after all.

Clock times used within the text as the plot unfolds are annoyingly inconsistent: formats such as 2 pm, 09:00, 6:30, 05:15 am and 9 o'clock are all used interchangeably without any rationale. A contact phone number which is passed between key characters is rendered as 06-99.99.99.99 which could have been better disguised by using, say, the Eiffel Tower information line.

Despite these miner (sic) quibbles, all in all this is a recommended read that incorporates underground exploration into a contemporary storyline in a largely realistic manner. To quote from the text, "Most people nowadays are too busy worrying whether they've got the right animal sewn on their polo shirt to think about exploring the quarries. I'm not into consumer society. I prefer the atmosphere below. Life underground isn't about the illusion of appearances. It's raw down there. It's real. You can be yourself."

The Greatest Intelligence Operation of World War II

FRY, Helen, 2019, ***The Walls Have Ears,*** Yale University Press, 319pp [ISBN 978-0-300238-60-0]

Book review by Martin Dixon

Taking German prisoners of war for a day out in Whitby, to dinner at the Ritz and allowing them unlimited gin seems an unlikely scenario but fact is sometimes stranger than fiction. Throughout World War II, selected prisoners of war whose knowledge could aid the Allied war effort were housed in relative comfort in Combined Services Detailed Interrogation Centres (CSDICs).

But the formal interrogations were only part of the picture. Not only the interview rooms but entire buildings and even the grounds were fitted with hidden microphones and conversations between prisoners were faithfully recorded in secret by German-speaking listeners.

After years of meticulous research, London historian Helen Fry has documented the history and workings of this undercover operation. At the outbreak of WWII, the first prisoners (mainly captured U-Boat crew) were housed in the Tower of London but activity soon moved to Trent Park (Cockfosters), Latimer House (Chesham) or Wilton Park (Beaconsfield).

Most of the book focuses on the mansion at Trent Park, where the highest ranking prisoners were held – peaking at a remarkable 59 Generals (and their batmen!). The listening room was known as the M Room (M for Mike i.e. microphoned) and at Trent Park was located underground in the basement, hence its relevance to Sub Brit.

The technology used was supplied by a combination of the American RCA company and the Post Office Research Centre (PORS) at Dollis Hill. The PORS also built Colossus for Bletchley Park and the listening operation which was part of MI19 had a close relationship with Bletchley.

Over the course of the war the operation gave insights into many aspects of the German war machine including radar and navigation technology, U-Boat bases and tactics, Enigma and coding practices and – crucially – the V (Vengeance or *Vergeltungswaffen*) weapons.

The book is the result of a detailed analysis of interrogation and listening logs – released by the National Archives between 1996 and 2006 – and of other official and privately published accounts. Survivors of the listeners have been interviewed; many of them were German-born Jewish refugees who had themselves been interned at the beginning of the war. One such listener spoke of his duty to bequeath an accurate record to future generations as "… without it, history would simply be hearsay."

As well as a selection of photographs, the book includes a hugely comprehensive set of notes and sources, a bibliography, an index, a list of abbreviations, and a list of all known intelligence staff. Small details abound including the quirks of individual prisoners, who generally split into pro- and anti-Nazi camps.

British Intelligence even forged the award by Hitler of an Iron Cross (Knight's Cross with Diamonds) to one general in order to encourage his boastful outpourings. As well as technical and strategic information, the listening centres helped uncover some of the most heinous war crimes and the Holocaust.

The whole book is riveting and criticisms are slight. At times there are so many players that it's difficult

to remember who is who and the index could perhaps be more comprehensive to include them. The list of abbreviations also misses a few such as MI19 and the other Military Intelligence branches. Enfield West tube station is referred to without mentioning that it's today's Oakwood on the Piccadilly line. On the production front, there is more bleed-through of text than I would expect for a work of this standard.

For anyone with an interest in the 'underground' war that supported our front-line troops, the book is highly recommended; the whole enterprise sits alongside Bletchley Park in its importance in uncovering the enemy's plans and technology.

NEWS – TUNNELS AND TUNNELLING

Tunnel under Stonehenge gets the green light

A tunnel could be built under Stonehenge after plans were given the green light as part of a £27billion masterplan to improve the nation's roads. For decades, motorists on the A303, which passes the stone circle, have endured severe congestion on the popular route to and from the South West.

Opponents have argued that plans for a 1.8mile tunnel to ease gridlock around the World Heritage Site could ruin the prehistoric archaeological surroundings. But the £1.6 billion project has finally been approved after years of controversy as part of the biggest road expansion fund since the 1970s. Under plans unveiled in 2017, the tunnel will run as a dual carriageway and will be a further 164ft away from Stonehenge compared to the existing A303 route.

A303 passing Stonehenge

Officials have promised the project will avoid important archaeological sites and will not spoil the view of the setting sun from Stonehenge during the winter solstice. The scheme is one of dozens intended to 'level up' the regions by improving road links. They have been unveiled as part of a Road Investment Strategy for the next five years.

In his first Budget, Chancellor Rishi Sunak told the Commons that the A303 is "one of our most important regional arteries" but has become "one of those totemic projects symbolising delay and obstruction". He said: "Governments have been trying to fix it since the 1980s. Every year, millions of cars crawl along it in traffic, ruining the backdrop to one of our most important historic landmarks."

SOURCE: *MailOnline,* 11 March 2020.

Storms expose hidden tunnel on Plymouth Hoe

Recent storms in the city look to have exposed a 'hidden' tunnel on Plymouth Hoe. The interesting discovery was made by a Plymouth man, who was walking his dog on the beach in front of the *Wet Wok* restaurant where concrete appears to have been washed away to reveal a 'cave'.

In 2017, it was reported how hidden bunkers and basements used by an old printing press were unearthed by builders working on a £5m housing development on The Hoe. At the time, Plymouth firm West Hoe Developments were constructing a four-storey property block with a surgery on a patch of land that was used as a car park for 60 years.

It was revealed that the site played a significant part in the history of city – the corner plot was home to international publishing firm W. Brendon and Sons Ltd, which was bombed during the Plymouth Blitz in 1941.

In 2014, a tunnel was also found on West Hoe tennis courts

Due to the devastation of the city, many parts were scattered and buried. The site opened as a car park in 1945. When contractors were on site, they found six old pre-war printers, a steam engine – and remains of a printed *Alice in Wonderland* book. Old basements and bunkers used by the former publishers have also been found – which contractors initially assumed was a mystery tunnel leading to Drake's Island.

Back in 2014, builders also uncovered a large limestone rubble-built tunnel at the former West Hoe tennis courts – which was supposedly used as an air-raid shelter during World War Two. Other rumours are of a top-secret tunnel network under Mount Wise, and that all the forts in Plymouth are connected by underground passageways.

SOURCE: *Devon Live,* 19 February 2020.

Ceneri Base Tunnel in Switzerland nears completion

The Ceneri Base Tunnel (CBT) will bypass the longest railway and deepest traffic tunnel, the Gotthard Base Tunnel (GBT), which was opened in 2016. With the CBT

as a continuation of the Gotthard tunnel, the new Gotthard railway line becomes a continuous flat railway for passenger and freight traffic through the Alps. At its deepest point, the GBT tunnel lies around 8,000 ft below the Alpine peaks. The inauguration of the CBT project which cost an estimated £2 billion is on track for September this year.

The tunnel is the third largest project of its kind running through the Alps after the Gotthard and the Lötschberg. The CBT's completion will mark the end of the New Railway Link through the Alps (NRLA) which also includes the 94-mile Gotthard and 21-mile Lötschberg Base tunnels inaugurated in 2016 and 2007, respectively. The NRLA is a Swiss construction project for faster

north-south rail links across the Swiss Alps, which was approved by voters in Switzerland in a 27 September 1992 mandatory referendum.

The new Ceneri Base Tunnel is composed of two single-track tunnels, each 9.6 miles long. The mammoth railway tunnel runs under the Monte Ceneri mountain pass in Switzerland's southern canton of Ticino, between Camorino and Vezia.

It is set to become an important southern feeder for the Gotthard Base Tunnel as the existing, proportionally steep track over Monte Ceneri is not suitable for high-speed rail or heavy freight trains. The CBT will ease local train traffic, mainly between the two major cities of Locarno and Lugano.

SOURCE: *MailOnline,* 20 February 2020.

LATE NEWS

Mystery medieval cave found at St Catherine's Hill, Guildford

Experts believe the cave discovered in early April by rail workers repairing a landslip below the ancient chapel on Guildford's St Catherine's Hill dates from the 14th century.

The sandstone cave is made up of several sections ranging from 0.3 metres to about 0.7 metres high. Originally it may have been much larger, but only this small part survived the digging of the railway cutting through the hill in the early 1840s. Initial findings by a specialist archaeologist suggest the cave was a later medieval shrine or hermitage associated with the early 14th-century chapel of St Catherine, the ruins of which overlook the Old Portsmouth Road in the south of the town.

The cave has a Gothic niche decorated in dots with a Calvary cross nearby. There are about seven or eight further niches and experts found considerable evidence of writing and other markings across the ceiling. The cave is partially covered in deposits of black dust, believed to be soot from lamps. The remains of two suspected fire-pits were also uncovered in the floor. Radiocarbon dating may be used to establish the exact period when the cave was in use.

A full and detailed record of the cave has been made and every effort will be made to preserve elements where possible during the regrading of the delicate and vulnerable sandstone cutting.

SOURCE:*The Guildford Dragon*, 13 April 2020.

Permission to fill in Queensbury Tunnel refused by government

Secretary of State, Grant Shapps, has prevented the Highways Agency and local authorities in West Yorkshire from starting the controversial £7million project to fill in the long closed Queensbury Tunnel between Bradford & Halifax. Mr Shapps said "I have taken a specific personal interest in Queensbury Tunnel. The official advice was to fill it in, but I have specifically prevented that from happening and will work with local leaders to come up with a better solution."

The news delighted local campaigners who have been fighting for more than five years to prevent the filling of the tunnel by Highways England, who now own all disused rail infrastructure, taking over this role from BRB Residuary, the last fragment of the old British Rail.

A decision is expected shortly on the West Yorkshire Combined Authority's bid for £23 million of Government funding towards the Bradford to Halifax Greenway which would see a walkway and cycle path through the tunnel.

Highways England is under fire for spending almost £5000 a week to operate a CCTV camera, floodlighting and a generator inside the tunnel. Critics also say that HE spent £1.2 million pumping floodwater out of the tunnel in 2019, but the water is now back at the same level as when work started.

SOURCE: *Railway Magazine,* April 2020.

Tunnels beneath Christ's Hospital, Horsham, West Sussex

Stewart Wild

General view of the main tunnel

Christ's Hospital, founded in London by King Edward VI in 1552, grew from an earlier charitable foundation of Henry VIII and is now a co-educational independent boarding and day school located since 1902 to the south of Horsham in West Sussex. It caters for about 900 pupils and occupies around 1,200 acres of land that was formerly a couple of dairy farms.

Built between 1899 and 1902, the attractive buildings, essentially Tudor in architectural style, contained some twenty million red bricks and over a million tiles.

The school's sixteen boarding houses are arranged in a line of eight buildings, four each side of the Dining Hall and central Quadrangle. Additionally there are two separate boarding houses for Year 13 pupils, who are known as Grecians, plus many other buildings serving as Chapel, classrooms, music school, theatre, museum and library, medical centre, laundry, sports facilities and staff accommodation.

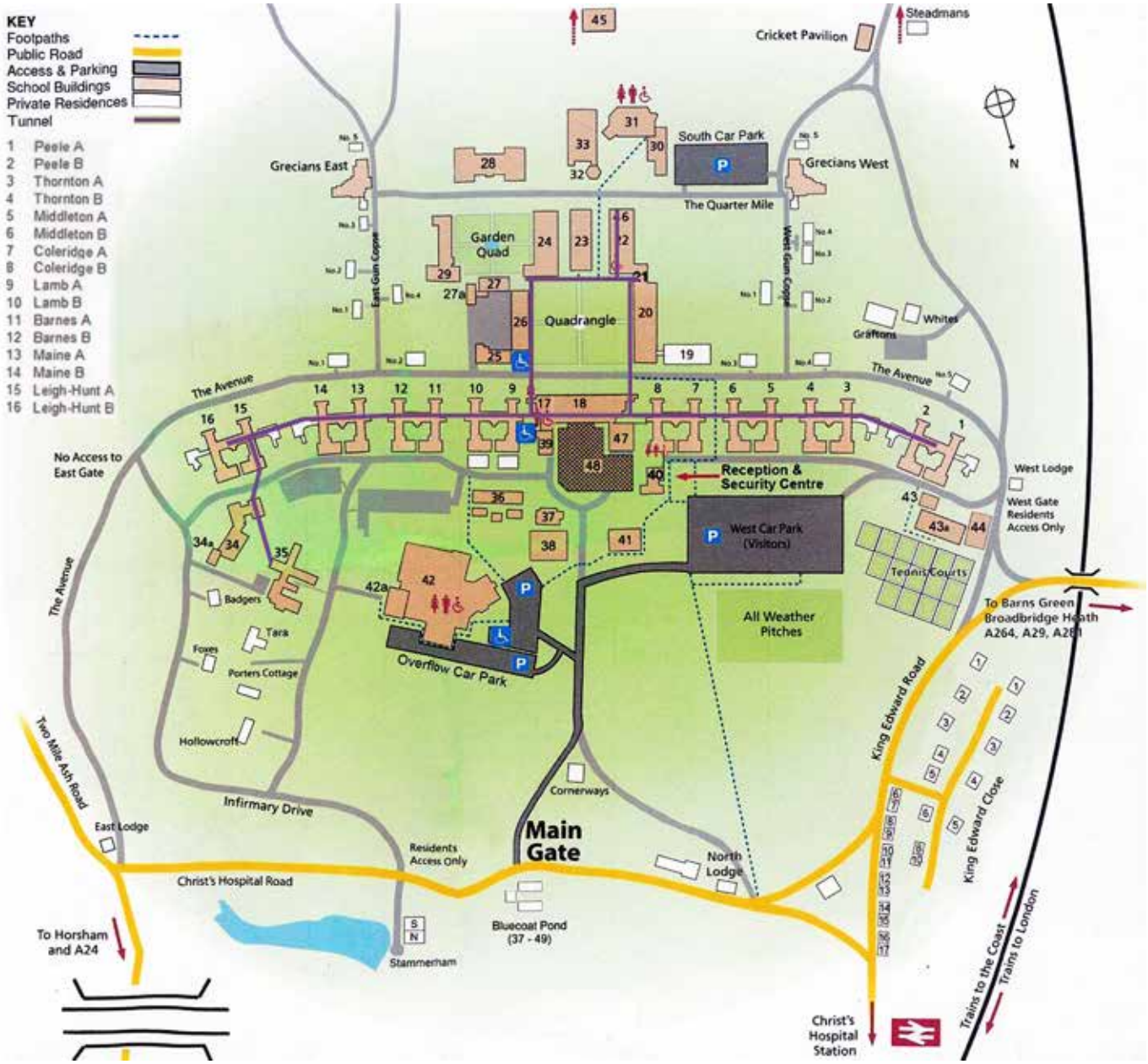
The school has an excellent academic record, with an impressive number of illustrious former pupils, and offers a wide range of activities, including a marching band that participates in the Lord Mayor's Show each year. Uniquely, the school has its own railway station,

Coleridge Block. This external shot shows the Coleridge Boarding House, one of eight imposing blocks above the central run of the service tunnels. Photo Martin Dixon

on the Victoria, Horsham and Portsmouth line, as well as having a named steam loco in the Southern Region "Schools" class.

A different sort of Tube

Running below the boarding houses and the Quadrangle, with various spurs leading off, is a network of service



Plan of the extensive campus of Christ's Hospital. The 'tubes' described in this article are shown in purple. The trunk of the system runs left to right beneath the Boarding Houses - each named after a former scholar. A circuit also runs beneath the Quadrangle with a spur beneath some of the teaching blocks. There is also a branch leading downwards (the Northern line?) which is blocked by a number of falls. This led to the original central boiler house, near the North Lodge.

Access stairs to the tunnel are provided from each Boarding House. This flight leads to Lamb

tunnels with an overall length of some two miles. Collectively known as the Tube, they contain a multitude of pipes, water mains, switches, wires and cables that can be easily accessed for maintenance.

The tunnels were dug 120 years ago as part of the foundations of the buildings above, and are substantial with an average height of eight to twelve feet and between six and twelve feet in width. They are for the most part lined with white tiles, generally dry underfoot and lit throughout by tube lighting.

Through a personal contact and former pupil (Old Blue), I was able to get permission for a small group from Sub Brit to make a visit underground during the school's half-term break in February this year. Our small group included our Chairman and our *Subterranea* editor Nick Catford, who came equipped with camera and tripod.

The scale of the tunnel system is clear from this photo. A drain runs down the centre of the corridor to allow any seepage to be drained

The Sub Brit party makes its way along the 'tube', passing through a later fire door, installed for safety purposes. The right hand wall shows the services - neatly separated into water, power, phone, data and fire circuits. Photo Martin Dixon

Guided visit

Our tour started at the western end where our host and guide, Building Maintenance Manager Neil Manning, had the special key to bypass the alarm system and take us down steep steps to the lower level.

The western extremity of the tunnel system, beneath Peele Boarding House

There have been many changes over the last century. The original water supply pipes were buried and came from a massive purpose-built brick reservoir on nearby Sharpenhurst Hill. This led to leakage and maintenance problems and the water supply and fire hydrants are now in the Tube and connected to the mains. The disused underground reservoir still exists, but derelict (and apparently visited now and again by 'urban explorers').

Sharpenhurst Reservoir; this covered reservoir was originally the source of the school's water supply. It fed by gravity to the now redundant water tower and hence into the underground water mains. Photo Christ's Hospital

There was once asbestos throughout the network. This of course has all now been removed – we were told at a cost of over £750,000. Like the buildings above, the tunnels are Grade II* listed and English Heritage has to be involved when repairs and alterations are made.

Side room off the tunnel system. Each boarding house had a number of these, originally used as storage for luggage, bedding and other supplies

At one time, the tunnels also provided a passageway for domestic staff to carry out their duties; we saw former laundry and drying rooms, Matron's storage rooms, dumb waiters no longer in use, coal stores and even the masters' former wine store (containing now only cobwebs).

On normal days, pupils march to lunch accompanied by the band. Previously however, in rough weather, the Tube was used to get to meals and lessons.

Wartime use

During World War II, we were told, the tunnels and side rooms were occasionally used as air-raid shelters, but as far as we know the buildings and their occupants did not suffer any bomb damage although a V1 doodlebug once landed in the grounds. Stories abound of masters and pupils even sleeping safely underground.

This modest alcove is the means by which plant and equipment are lowered into the tunnel system. Other surface connections were used for coal storage - for example under the Headmaster's house

One of the boiler rooms beneath the boarding houses. The distributed system offers more resilience in case of failure and ensures all blocks have a reliable source of heat and hot water. The yellow pipes are the incoming gas main

Nowadays all the equipment is thoroughly modern. Under each house is a state-of-the-art boiler room; there are water and gas pipes and electricity and fibre optic cables everywhere. We were allowed to look into a locked room containing a vast amount of computer equipment, internet servers, telephone hubs, access control cables, fire alarm systems and CCTV controls.

There is emergency lighting throughout the Tube, while the outside lighting for the buildings above is so arranged that it all comes on at once throughout the campus. All this equipment needs constant maintenance by plumbers and electricians and the like. Neil told us he is responsible for a full-time staff of fourteen, plus outside contractors as and when required.

This underground room is used as a control and filter room for the distribution of the school's TV network. Only designated channels can be viewed to prevent inappropriate programmes being watched

When the roof fell in

Around the Quadrangle, the roof of the Tube serves as a cloistered pathway. In some areas rainwater has penetrated the paving, become acidic and corroded the ceiling supports. Repairs are ongoing and in several places we had to squeeze through a forest of Acrow supports temporarily holding up the roof. At one point we could see the new concrete roof where an earlier repair had been effected.

Strengthening supports in the tunnels beneath the cloisters and quadrangle. Brick foundations for the buildings above can also be seen

Cul de sac side tunnel beneath the west classrooms. The fluorescent lighting has encouraged the growth of some weeds at floor level

Part of the tube system showing evidence of water ingress which will need to be tanked by external excavation. The black cylinder top left is a British Telecom junction box

General view of the tunnel system. Middle distance top left shows outlets from the water main

These two photos show the two exit signs for the (Samuel Taylor) Coleridge Boarding House from the main corridor. The start and end of the signs have been cut through by fire door frames. With eight boarding houses above, it is easy to lose one's sense of direction! Coleridge is a girls' boarding house and the entrance door at the top is protected by an alarmed security system. Photos Martin Dixon

Strengthening supports in the tunnels beneath the cloisters and quadrangle. A drainage pipe can also be seen running across the tunnel in the middle distance

Drainage pipe and building foundations beneath the east side of the quadrangle

Tunnels beneath the main Dining Hall

Lamb Heating Sign. The feeds from the service tunnels dating from the days of the centralised heating system are all neatly labelled with metal plaques. The pipes beneath this label led to Lamb block B, Front and Rear, Top Floor Corridor Radiators. Photo Martin Dixon

In some places there were light wells and it was possible to see daylight above. The light and the ingress of rainwater had in a few places permitted the growth of fern-like plants.

Very naughty boys

Ferns aren't the only intruders. Over the years many boys have managed to get in to explore the secret underground network.

Tunnel beneath the cloisters. The brickwork is part of the foundations for the Chapel which at this point lies overhead

On one occasion in the early 1990s very naughty boys got in underneath the Chapel and let off stink bombs and smoke bombs during a service, causing mayhem above.

Crawlway off the main tunnel system that allows services to be delivered into the heart of the buildings above. It is through a passage like this that stink bombs were allegedly let off under the Chapel

Many other pranks are legendary, but increased security and modern CCTV coverage have meant that break-ins are now thankfully very rare.

Appreciation

We are grateful to the Headmaster for authorising our visit and to Jim Nelhams and Neil Manning for taking the time and trouble to give us the benefit of their knowledge and experience. It certainly is a different sort of Tube.

All photos Nick Catford unless stated

Subsurface lavatories at Kennington Lane, London

Subsurface public conveniences are, not very conveniently, being closed, sealed off, filled-in, and even in some cases adapted for other purposes than 'spending a penny'. David Perrett has reported on a previous 'gentleman's toilets' at 180 Kennington Lane now called 'The Arts Lav' which has been 'taken over by some local artists as a sort of micro arts space. Down the stairs behind the cast iron railings you find a Victorian Gents, with original marble urinals by Finch & Co. of Lambeth and three heavily graffitied cubicles. There are two cisterns – one is modern but the other is a fish tank cistern probably original and dating to 1898. The vent pipe outside is also by Finch & Co.; it is topped with a fine golden crown'.

So-called fish tank cisterns in public lavatories had glass sides, but were presumably not intended as homes for ornamental fish!

Your scribe's earliest memory of man-made or man-used underground space was of the former sub-surface gentleman's lavatories (there were none at the location for ladies!) outside the former Swan & Sugar Loaf public house at the Croydon end of Brighton Road, South Croydon, which he passed on the way to and from school from 1945 to 1951. Rather scary posters warned, printed in black on blue-green paper and overprinted with the large letters VD in red, that 'delay is dangerous'. Having no idea what was the significance of the large red letters, he concluded that 'hanging on' when you needed to 'spend a penny' was life-threatening! So every opportunity was taken to 'go' on the way to school and back, just in case!

SOURCE: PERRETT, David, 2014, It's those fish tank cisterns again! *Newsletter Greater London Industrial Archaeology Society* 274, page 6.

New finds underground at Deepdene House, Surrey

Sam Dawson

On the day of the dig, and each person tackling or uncovering a different feature. The sun shines between hailstorms

"The Outlaws loved cellars. There was a door under the stairs. They opened it. There were steps. Yes, most certainly cellars. Very cautiously the little procession crept down. Glorious cellars, enormous cellars, heavenly vistas of cellars opening out of each other. They explored blissfully for some time for sheer love of exploration."

From *William in Trouble*, 1927, by Richmal Crompton

For anyone captivated by England's underlands the name Deepdene is likely to conjure up a rich collection of subterranean lacunae, all surrounding the palatial Dorking mansion that stood at its heart. First, the Southern Region control bunker, inserted into the hillside folly and laboratory tunnels of an alchemically-inclined early owner, and ready to render vital service throughout World War II. Secondly, an excavation created for that same man, Charles Howard, and described at the time as 'a cave digged thirty-six paces long, four broad and five yards high'.

And more: a decaying ice house; a castellated bridge, its arch now buried in the ground; a once-entombed mausoleum recently returned, triumphantly to the light; a grotto that conceals the ruination of a dream; and a collapsed tunnel intended to pierce an entire hillside.

All of these remain, in varying degrees of preservation, from crumbling to pristine. What doesn't, sadly, is Deepdene House, the extraordinary stately home built by the once obscenely-rich Hope family; a national treasure of a property, lost to posterity in 1969. And lost with it, of course, its vaulted cellars: glorious cellars, enormous cellars, heavenly vistas of cellars, complete with a secret room with a secret safe – only discovered during their demolition.

Set, literally, within a wooded deep dene, the shrunken remains of the once enormous estate are now being painstakingly returned to public use by the Friends of Deepdene, a volunteer group associated with Dorking Museum.

From the overgrown parcel of land owned by the local council they have created a walking trail and, along the way, uncovered the greened fragments of the past, showing the slow decline and death of the great house. These include this extraordinarily rich list of underground features. Which has just become a little longer, after underground enthusiasts working with the Friends uncovered a series of subterranean voids.

Challenging decision

The collaboration began when two of us were making ready to go into the Southern Region bunker. We had permission, but this wasn't known to a nearby Friends of Deepdene work party, whose experience of those entering the tunnels is of urban explorers forcing the entrance, followed by youngsters who, probably just a

day before we arrived, had left graffiti and set fire to one of the internal wartime doors.

Once challenged, it seemed only polite to explain not only what we were doing, but also to open a conversation about the site's military and underground history, and to offer help identifying any of the features that it has left behind, and over which the volunteers might have either puzzled or, literally, stumbled. Which there were, and over which one of them had: a pipe sticking out of the ground.

Several possible explanations offered themselves, but the only way to be sure was to arrange to take a look another day. Which we did, liaising, as we were to do throughout, with the always helpful Sue Tombs of the Friends of Deepdene and Dorking Museum. She was accompanied by Roger Troughton, the volunteer who had questioned our going into the bunker in the first place, and who displayed a keen eye for spotting concealed features in the undergrowth.

That inspection centred on the aforementioned pipe: a short, capped-off stub sticking up from the earth. Plus, nearby, a small twentieth-century half-filled brick enclosure. But then there was more. The top of the pipe was faintly yellow-painted. The broken remains of a concrete cap buried among the rubble in the brick-lined hole had a yellow arrow on it. And little by little, across a distance of maybe thirty yards, more buried slabs of concrete were uncovered; all intended to merge into the ground, but all, somewhere, with an identifying square of yellow paint.

Meaning what? Meaning, potentially, lots of things. We were told of someone's childhood memory that there was an air-raid shelter at that spot. But if so, why? Not for the public, or those working in the big house, who had their own protection. Maybe for the crew of the anti-aircraft gun that was sited at the dene? But there was no ladder up, ruling out the brick enclosure as an emergency exit, and the concrete caps did not make sense as shelter entrances.

Could the pipe be part of a fuel tank for generators and a searchlight or a barrage balloon winch? But fuel oil usually escapes, and the smell never goes. The only thing we could agree on was that the concrete remains looked like they might date (including a margin of error of a decade either way) from perhaps between the 1890s to the 1930s, and not from the house's older history. It was enough to justify offering the Friends that we would organize a dig.

Yellow for danger?

But only just. The current information from the Health and Safety Executive suggests that yellow now means gas, petrol or other fuel and that we might be calling volunteers out to uncover a gas main. Thankfully, though, a search of the maps held by the local council showed that no services ran anywhere near the spot. There are a number of experienced diggers living nearby and several signalled that they would be interested. So as not to waste their time, three of us decided on a pre-dig, worth-it/not-worth-it? inspection.

First visit: the unexplained brick enclosure and pipe discovered by the Friends of Deepdene

Initially we faced the difficulty of finding the row of concrete caps which we had reburied a few weeks before. We also faced Storm Ciara and the kind of driving rain that within minutes penetrates everything you are wearing. Sodden, I was holding a crocodile clip against the buried pipe to allow the use of a cable detector and generator, which ultimately told us that there was some pipework below.

I went on to say something about the weather, but what came out, unplanned, was "Isn't this fantastic?" When you're contentedly doing something in cold, sheeting rain that anyone with any sense would get out of, you know that it's something you want to be doing.

And it got better. One of the caps had a dauntingly heavy iron manhole cover set into it, and, along with the pipework survey, lifting it was the point of the day. If, opened, it revealed, say, gas taps, we would call the dig off. But it wouldn't open. Until it suddenly did. A crack appeared at the edge and, levered with a folding shovel, it gave off the sound of something empty below. Then an echo of water.

Lifted, the cover revealed a six-foot-wide water tank sunk seven feet into the earth, with rusty ladder, oversized stopcock, and multiple pipe apertures pointing toward the other capped areas. Also, pointing the other way, a large-aperture pipe blocked with cement and stoppered with a log. We resealed and camouflaged the cover. The dig had just got the go-ahead.

Final moments of the storm-lashed pre-dig inspection, and a first look inside the uncovered concrete cap. Note the thickness and weight of the manhole cover

This is what the concrete concealed, a water tank, complete with ballcock, that would turn out to be the first of five - each bigger than the last

Process of elimination

We updated the Friends and submitted our archaeological dig risk assessment to the council. Many of us worked on the history, particularly on eliminating possibilities. One was that this was a defunct water supply to a local housing estate built on Deepdene's land in the 1920s as the house's fortunes declined. Inconveniently, the main bore entering the tank came from that direction. The quality of the surface concrete looked too good to be wartime and the Friends had already removed an above ground static tank for WWII firefighting close to the house.

Neither Surrey Fire and Rescue nor English Heritage had a record of anything being there. One theory was that the tank might have been for the use of gardeners watering the flowerbeds, but that would fall down if there were more than one or two of them. Feeder tanks to a fountain? The same logic applied, and it appears that there wasn't one anyway.

The Betchworth water engine

Then we were sent an article from *Surrey History* on the Betchworth 'water engine', a watermill which used the power of the nearby River Mole to pump well-water to the Betchworth Castle estate. When in 1834 the Hopes bought that stately home to add its grounds to their own, knocking the castle down to use it as a folly, the water was diverted up the hill to their house at Deepdene, 1.2 miles away.

The engine was still in use nearly sixty years later when, in June 1892, the *Dorking Advertiser* reported that: "The wooden pipe which passes over the Brighton Railway near the tunnel in the neighbourhood of Punchbowl Lane, encasing a pipe which conveys water to Deepdene, became alight a few days since through a spark from a passing train, and damage to the extent of a few pounds was caused."

Between 1897 and 1899 the Dorking Water Company sank a 100ft deep borehole by the water engine and installed both a new waterwheel and a larger-bore water main to feed properties in the town. Reportedly, the water this provided was found to be sandy and needed filtering.

Within three years the company had added a new site in Dorking, where a state of the art steam-powered pumphouse was to be the mainstay of the town's supply for the coming decades. By 1919 the Betchworth water engine was redundant.

It began to look like we now had a partial answer to what those thirty metres of concrete caps were there for. But not to the paradox that the house, a true historical gem, would have needed water holding tanks in 1834, perhaps sixty or more years before the concealed concrete features we were looking at were built.

Working forward from that date it also had to be taken into account that the last time the house had any serious money spent on it was in the 1920s and 30s, when it served as a high-class but low morals grand hotel whose behind-the-scenes owner was a notorious honours peddler, J. Maundy Gregory (see *Subterranea* 44, April 2017, page 34).

DORKING.

"An Epitome of Paradise."

"The Garden of Eden seems well imitated here . . . the pleasures of the garden were so RAVISHING that I can never expect any enjoyment beyond it but the Kingdom of Heaven."—AUBREY.

THE HISTORIC

DEEPDENE MANSION.

Deepdene Hotel, Dorking

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High class, high hopes: the Deepdene Hotel before its days as a louche rendezvous. At least its owners carried out the necessary maintenance - Southern and British Railways didn't, providing the excuse for its demolition

It was clear that the avenues of research had been exhausted. If there was an answer it would only be found underground.

Going down (during) a storm

Seven-strong, we met in time for the opening fanfare of Storm Jorge and went to work, variously scraping clean the concrete caps to ascertain their size, and digging out the brick enclosure which, apart from the ballcocked tank, looked like our only hope of getting underground. A vain one, as it happened.

It turned out to have been filled with ballast, probably in the 1960s when there were concerns for the safety of walkers (it also contained an empty plastic container for three condoms from that period). Disappointingly, we hit the bottom and nothing further was revealed. Possibly there would be a valve on the other side, and that was scheduled for a follow-up dig.

Meanwhile, the surface clearing and an examination of the opened water tank suggested what else was tantalisingly securely concreted into the earth. Working from the water engine side there was that first tank with the ballcock. By shining a powerful torch in its pipes you could just glimpse another, bigger underground tank, which corresponded to the larger concrete cap that was the next in line on the surface. Twice the size of the first one, it had long since had any possible manhole access very securely cemented over.

Walking on the surface, we next came to another, considerably larger, buried concrete square, suggesting a further tank, much bigger than its two predecessors. Then there was a wide space which we would later discover (from inside) concealed another, more deeply-buried sealed entrance. Finally there was the ultimate and smallest concrete cap, apparently leading to a final tank, inaccessible.

The line of buried chambers confirmed that we were standing atop the settling tanks that once cleared, purified and held the water supply for one of Britain's richest and most palatial stately homes. All built to sit sunken and disguised in the landscaped grounds, so as not to spoil the owners' aesthetic enjoyment of what was described as a new Garden of Eden; all discreetly marked with yellow paint so that they could be found by the workmen who would have needed, from time to time, to maintain and clean them. And all but one of them massively sealed.

The day of the dig

Problem solving

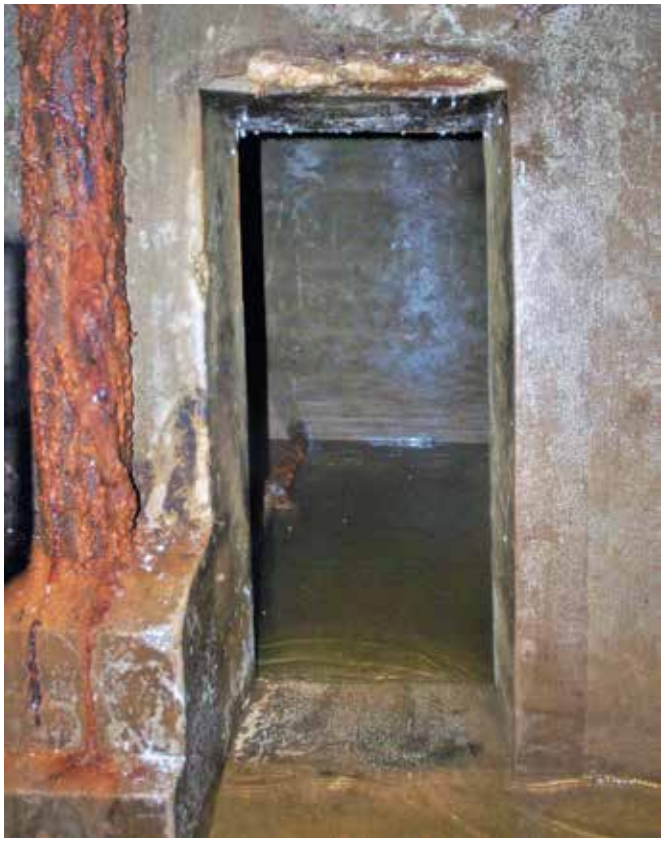
Apparently. That last small cap looked to be utterly solid but someone kept probing at it until he had discovered, by sound, that it had metal set it into it. This couldn't be distinguished by eye, but he worked away at it, despite the rest of us being sure that it wouldn't budge. Finally, as with the previous visit, the sound changed and the smack of the lump hammer was answered by the echo of an empty space. And what a space.

Because, when it was prised open we had our answers. It revealed maybe a foot of concrete that had been expertly set upon a ringed entrance of pre-1851 handmade bricks. All the near-surface work we had been puzzling over had been added on top of (and preserved) an earlier system's original entrances. And that earlier system was what we were looking into, and it was bigger than anything we had expected.

Contrary to appearances, the final concrete cap concealed a way in to a superb double-chambered cistern likely to date back to the 1830s

The ring of antique bricks is likely to have been the original, sunken entry, with an earlier type of hatch or manhole cover. The brickwork just above it has had a further foot of concrete added on top

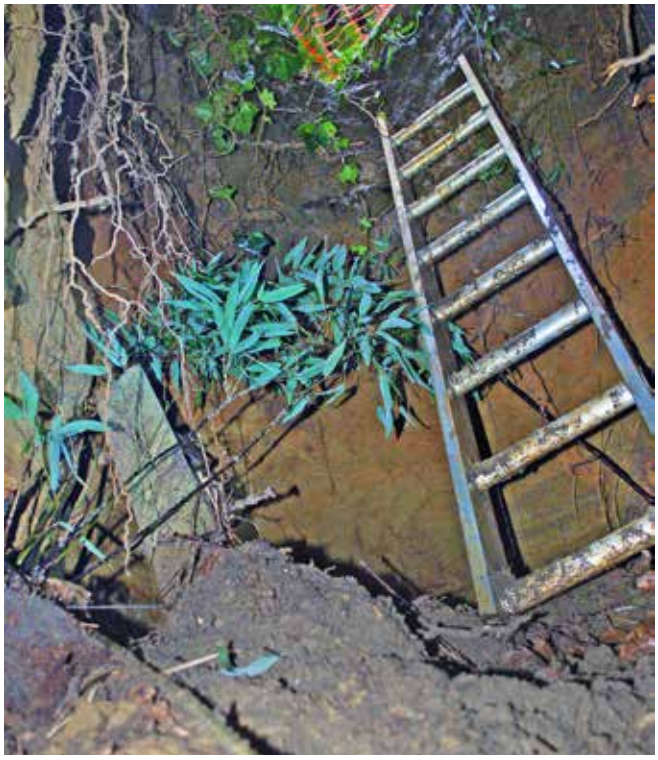
Inside the cistern that is the last and biggest of the series of tanks



A door off the main cistern leads to an adjoining chamber, the last but one in the series

Below us, sitting in the darkness, was a cistern that matched the needs, and even a little bit of the grandeur, of Deepdene House. Nine times or more the size of the first tank we had opened and over twice as deep. A strong torch beam directed down showed clear, clean water

below us and, unreachably, an apparent step, pipework, and then a sunken doorway. It was a moment to treasure.



The day before the dig, exploring a hole into a mine that had suddenly appeared in a local garden

A dispirited fag-end

It meant we would have to stop there though. We couldn't see more without getting inside and to do that would mean a single rope technique entry with wire ladder and tripod to hang it all from. Which we didn't have.

The day before two of us had helped a local householder in whose garden, following storms Ciara and Dennis, a dramatic 10.5ft-deep hole had suddenly opened up, swallowing his dog. On that occasion we'd taken a rope and harness, so someone promptly volunteered to be dangled into the void, like a human yo-yo, to report back to the rest of us. Perhaps luckily the harness hadn't come with us on this day and an alternative was decided on.

Taking turns with the waders. At the lowest point of their downward-curving floors the remaining water in the tanks is around two feet deep

This took advantage of the Fetcham phenomenon. This is the fact that this small village seven miles away – whose description by the architectural historian Nikolaus Pevsner opens 'Dispirited fag-end of Leatherhead' – has contributed a disproportionally high number (three) of members to Subterranea Britannica, as well as being the home of John Henderson of Chelsea Speleological Society's *More Secret Tunnels in Surrey* fame. So one of them drove off there in his van, to return some time later with extending ladders and a pair of waders.

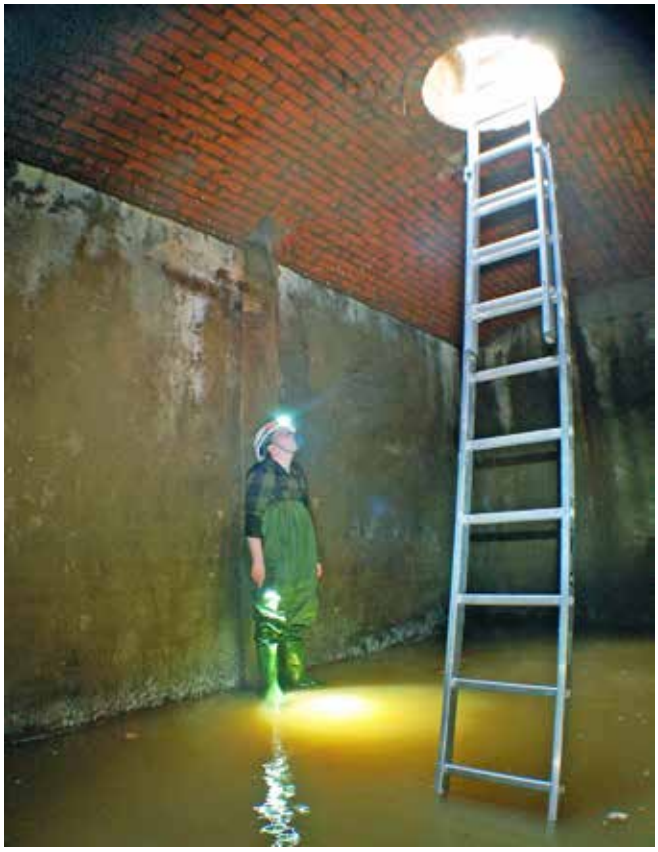
The water in both tanks is still notably clear and clean

Through the door and inside the penultimate chamber. The pipe leaving it at an angle points toward the built-later brick enclosure that housed a drainage valve

A great discovery

And what they let us see was lovely. A deep, clean cistern probably dating back to 1834, and with a striking curved brick interior roof that resembled that of an icehouse. It measured 20 feet long by 11 wide. Its bottom curved down to a bowl shape (meaning we did each have to watch our step, especially as, with only one pair of

Like the final cistern, chamber four has a curved, icehouse-like ceiling, complete with access hole. This entrance, like tanks two and three, has been filled



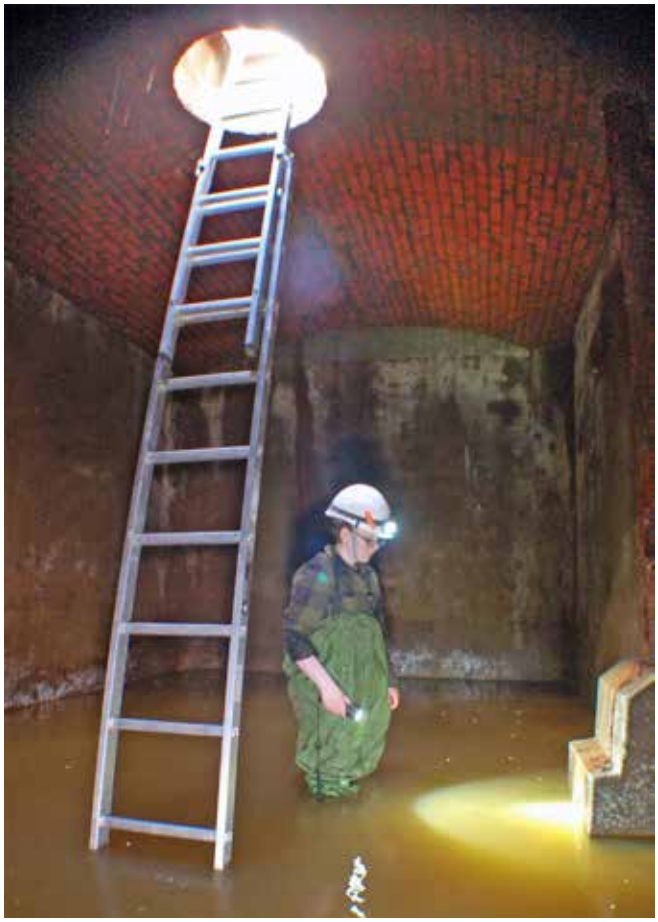
The way the bowl-shaped floor curves down is illustrated by standing on its edge and then moving to the middle (right)

waders, entry and exploration had to be done singly: one down alone, all the others up top). Everyone's patience was commendable.

The water was crystal clear and lapped the step up to a small doorway, acting as a weir, that gave onto a further 20 ft by 10.5 ft chamber, the penultimate one in the chain of tanks that led into that largest one and, from there, once upon a time, into the sinks and baths and whiskies-and-water of Thomas Hope, Benjamin Disraeli, Winston Churchill, J Maundy Gregory and the others who lived, worked, played and stayed at the lost mansion.

It had been an extraordinary day, and we closed it by resealing and camouflaging all the features, ready to return for the handover of what we had found to the Friends of Deepdene. We also scheduled that occasion for our final tasks: accurately measuring everything and finishing digging out the brick enclosure – which by now we understood was the tanks' drainage facility, apparently repaired or replaced and imperfectly capped when the house's fortunes were at their nadir.

We don't yet know when, prior to the house's later demolition, the tanks were sealed and forgotten – rendered obsolete by connection to the Dorking Water Company's mains supply to the 1920s housing estate. Perhaps 1919, perhaps later. Because they were lost to memory they remain original and unspoilt. They contain no graffiti, bottles, drinks cans, remains of fires, candles or urbexers' tags. The plan is to keep them that way.



And what of the actual cellars? – an eyewitness account

Speaking of the Friends, they run regular work parties that clear paths and control the undergrowth. Among the volunteers we met Cliff Weight, the first person really to rigorously research Dorking's South Street Caves and the author of what is still the best booklet on them.

In 1949, aged 16, he had started work at Deepdene House, leaving in 1966 when British Railways abandoned the property. As he reports: "The Deepdene was always considered a temporary move brought about by the war, but lasted from 1939 to 1966!"

He remembers the cellars well: "They ran the length of the house and rooms were mainly used for filing although

two or three, where there were windows, we used as offices. There was also a social room with armchairs, card tables, and a dartboard.

"There were two staircases down to the basement and a further wide flight of steps went down to a lower basement and then up another staircase. These stairs went up behind the kitchen and then higher still for more filing and a room used for table tennis. In later years, because of danger of collapsing, the stairs became out of bounds."

In the 1930s, in the dying days of the by-then notably seedy Deepdene Hotel, a gaudy, unapproved and locally-unpopular illuminated sign was installed on its roof. Exploring the icehouse in the grounds, Cliff Weight and a friend found the sign dumped there and, in a youthful prank worthy of Just William and his gang The Outlaws, reinstated it one night, creating a local scandal that, he says, would have cost him his job if he had been identified as its perpetrator.

Over and out

We returned three weeks later for our last (for now) visit. We had received news of further, possibly drainage-related, chambers discovered beneath the front lawn of a nearby house but they will have to wait until Covid-19 has passed. Our tasks were to finish digging and take down Sue and Roger, two of the Friends of Deepdene, the organisation that has done much to keep the memory of the great house and its fantastic history alive, and its paths and gardens explored and enjoyed.

We had the pleasure of being able to show them what we had found, something far more impressive than we had ever expected: an intact, preserved and rare example of a country house's water system dating back to the 1830s. But also something more: a separate, but once connected, surviving fragment of a much-mourned historic house which, until now, razed to the ground, was believed to be completely lost to us.

Photo credits: Sam Dawson, Tony Page and Clive Penfold

Find out more

Deepdene Trail: www.deepdenetrail.co.uk

Bagnall, A. (2019). *The Deepdene – A Landscape Rediscovered*. Dorking. Cockerel Press.

Crocker, A. (2011). *The Water Engine House in Betchworth Park, Dorking* in *Surrey History* Volume X.

Is some of John Logie Baird's pioneering television equipment still in a sealed tunnel under the site of the Crystal Palace, south London?

The first ever 'outdoor television broadcast' was at the Crystal Palace, south London, on 8 May 1931. The Derby was shown on a giant screen formed of a three feet by six feet array of 2,100 flashlamp bulbs. The inventor, John Logie Baird [1885 – 1946], is thought to have stored this cumbersome precursor of the cathode ray tube and other equipment in a supposed quarter mile long tunnel linking the basements of the north and south water towers that once dominated the south London skyline. The main Palace building was destroyed by fire in 1936, and the water towers demolished during World War II on account of their potential usefulness as landmarks for the pilots of enemy aircraft.

It was suggested in 1999 that some of Baird's equipment survives in the presumably partly collapsed tunnel. Although there was in that year the possibility of the Palace site being developed by London & Regional Properties, in fact the area of the Palace floor has not yet been built on.

All your scribe can add to this tale is that he did, years ago, assist member Simon Mickleburgh with a survey of possible bat hibernation sites, including wriggling into part of the Palace basement. Neither bats nor electrical

equipment were to be seen, although the void entered was far from extensive, so Baird's kit may indeed still be there somewhere.

SOURCE: AMBROSI, Mario, 1999, Unique equipment designed by John Logie Baird, the inventor of TV, may lie buried on the site of the old Crystal Palace. Threat to television history as site of early research goes under the bulldozer. *Croydon Advertiser*, 8 October 1999, page 14.

Gubel Bloodhound Missile Site, Switzerland

Tim Wellburn

Coast Defence Study Group/Fortress Study Group (CDSG/FSG) party

Once a familiar sight in the 'bomber country' of the East of England, now only a few dilapidated concrete structures and the tell-tale octagonal patterns of ageing launch pads reveal where Bloodhound missiles were formerly deployed.

Three Bloodhounds at RAF West Raynham in Norfolk. Photo from RAF Air Defence Radar Museum, Neatishead

Of the 738 Bristol Bloodhound surface-to-air missiles built, perhaps a couple of dozen survive in museums scattered across the UK and in the few other countries in which they served. The Swiss, however, do things differently. In the Canton of Zug, on a rural hilltop, an extant battery of Bloodhounds still points menacingly skywards. There are spare missiles in the magazines and control console screens flicker with blue and amber lights…

Bloodhound Mark II - Vital Statistics [1]

Weight:	2,270 kg
Length:	8.45 m
Range:	80 km
Ceiling:	19,800 m
Speed:	Mach 2.7
Propulsion:	2 x Bristol Thor Ramjets and 4 x Gosling Solid Fuel Booster Rockets
Guidance:	Semi-active radar homing
Warhead:	179 kg Continuous-rod
Fuse:	Pulse radar proximity fuse

Bloodhounds beyond the UK

The Bristol Bloodhound surface-to-air missile (Mk.I) entered service with the Royal Air Force in December 1958, deployed to defend the V-Bomber airfields and "Thor" Intermediate-Range Ballistic Missile (IRBM) sites. A Mark II version was introduced in 1964. This was a much more sophisticated, capable and longer-range weapon [2], which also saw RAF service overseas with No.65 Squadron at RAF Seletar, Singapore (the old flying boat base); No.33 Sqn at Royal Malaysian Air Force Butterworth (near Penang); and No.25 Sqn in Germany at RAF Brüggen, Laarbruch and Wildenrath. [3]

Type 87 fire control radar plinth at RAF Laabruch in 2010. Photo Nick Catford

Type 87 fire control radar

Bloodhound was also exported to selected countries. Sweden bought the Mk.I missile (which they designated the Rb65) and later the Mk.II (Rb68). Rb is an abbreviation for Robot, which in Swedish means missile. Australia also acquired Mk.Is. No.30 Sqn RAAF, to date the sole Australian squadron to operate ground-to-air missiles, was based in NSW from 1961 and, in a potentially tenser role, in Darwin during *"Konfrontasi"*, Indonesia's undeclared war against the new State of Malaysia.

The Republic of Singapore purchased the RAF's Seletar Bloodhound system in 1972. Operated by No.170 Sqn RSAF, initially it provided the Republic's only reliable night-time air defence. [4]

Swiss Air Defence Procurement and Bloodhounds

The Swiss Federal Parliament, never enthusiastic about investing in defence (see *Defence in Depth*, *Subterranea* 51) had concluded by 1961 that the Cold War had become icy enough to justify it approving funding to purchase the Bloodhound Mk.II (designated BL-64 in Switzerland), with further appropriations in 1963 for related land acquisition and buildings.

At much the same time, 18 Dassault Mirage III aircraft were procured. The two weapon systems, BL-64 and Mirage, were intended to complement each other in providing high-level, long-range air defence – the former explicitly, and controversially, beyond Swiss borders.

The succession of fighter aircraft operated by the Swiss Air Force is worthy of note. [5] Locally produced French Morane-Saulnier MS406 fighters were supplemented in 1939 by the purchase of 129 Messerschmitt Bf 109s. These saw early – and tactically successful – combat against intruding Nazi German aircraft, but their pilots were quickly reined-in to avoid provoking a Nazi invasion.

The Messerschmitts were replaced in 1949 by North American P51 Mustangs, the latter bridging the gap until the Swiss entered the jet era with de Havilland Vampires and later Venoms (both of which went into production in Switzerland). The purchase of Hawker Hunters followed (beating the F86 Sabre in competition). These remained operational – latterly in a ground attack role – until 1994.

Two Bloodhounds pose purposefully at Gubel. All four of the Gosling solid fuel booster rockets can (just) be seen on the nearer missile. The acceleration of the missile was remarkable, reaching supersonic speed only shortly after leaving the launcher

The Swiss BL-64 Bloodhound system was located in the Mittelland and Jura regions, protecting the country's major centres of population and industry. It comprised six missile sites with a total of nine "Fire Units". Each Fire Unit consisted of a control point with a command post, radar system, deployment site, eight guided missile launchers and transmission systems, as well as missile magazines, a power generation system and related infrastructure.

The unassuming main gate to Gubel Bloodhound Missile Site. The former commandant stands ready to welcome the visiting CDSG/FSG party

The Gubel Missile Site

Gubel is a modest (913-metre) hill near the village of Menzingen in Canton Zug, otherwise best known as a Confederacy battle site (1531) and for its nineteenth-century Capuchin convent. The Gubel Bloodhound battery, BL-64-ZG, established atop the hill, remained operational until 1999. It was listed as a historical site in 2000 and is maintained as a museum by the Canton Military History Foundation (MHSZ). Their members include former military personnel from the facility, who provide informed guided tours to interested parties. [6]

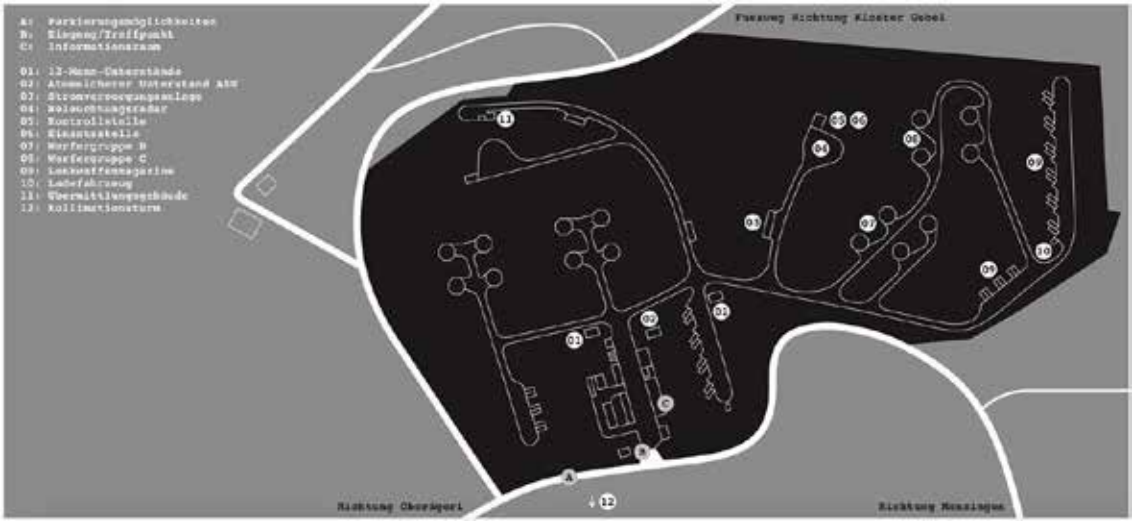
Part of the missile control system. Various 'live' consoles were set up in what is now the museum block (marked C on the site plan)

A partially stripped BL-64 Bloodhound in one of the magazines. The Thor ramjets are the upper and lower cylinders attached to the body of the missile; the cylinder at the bottom of the picture is one of the Gosling booster rockets

An unassuming main gate opens onto a paved area with a guardhouse to the right and, on either side beyond that, a short row of single-storey concrete buildings. This is the extent of the site's barracks and office space. One of these buildings is now used as the museum information room, which also houses 'live' control panel displays, and where the induction briefing for visitors takes place.

BL-64-ZG contained two Fire Units, designated FE1 and FE2. The former effectively surrounds the entrance buildings; the latter lies off to their right (north west), a site layout largely conditioned by the topography. The deployed missiles we inspected, and their associated control/operations centre and power station were part of FE2, the magazine we visited (with its sectioned missile) belonged to FE1.

The Museum has produced a small German-language brochure which helpfully includes the site plan reproduced here (the plan is orientated with west at the top). The legend/explanatory notes that follow are drawn from the brochure information.



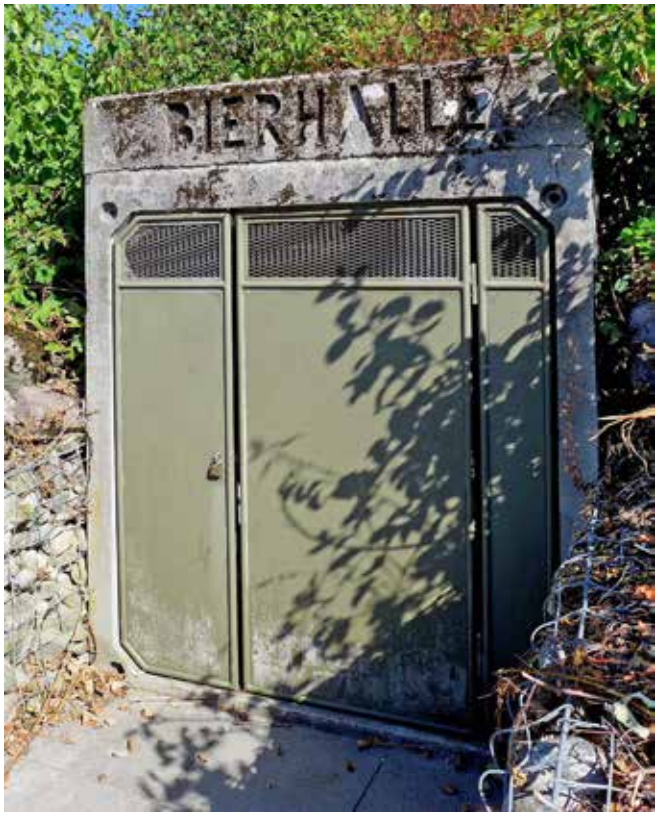
Gubel Bloodhound site BL-64-ZG: Site Plan (reproduced from the MHSZ Museum brochure)

B: Site Entrance

C: Museum Information Room

01: Personnel Shelters

02: Nuclear Shelter



The nuclear shelter (marked 02 on the plan) ...and evidence of a Swiss sense of humour

There were various shelters on the site to protect the operating and surveillance teams, including personnel shelters in the area of the guided missile launchers.

03: Power Station

A set of generators, in a hardened facility, provided a power supply to the weapon system and its related infrastructure, independent of the electricity grid.

Two of the diesel generator sets in the FE2 power station. The generators were built by Oerlikon

04: Illumination Radar

The task of this radar was to search for an air target assigned to it, to record it and to illuminate it until it was successfully combated. The radar echoes reflected by the target were used to determine the target data azimuth (ie bearing), elevation, range and speed. These data were transmitted to the operations centre for processing.

The twelve-sided building housing the illumination radar (04 on the plan) and, to its left, the semi-sunken bunker of the FE2 control authority and operations centre (05 & 06)

The main control console within the illumination radar building

05: Control Authority

The crew in the control post was responsible for all operational and tactical issues,

ordering, coordinating and monitoring the work of the Fire Unit.

06: Operations Centre

The computing centre of FE2. From here, all technical processes were coordinated and monitored from before a guided missile was fired - until it hit the target.

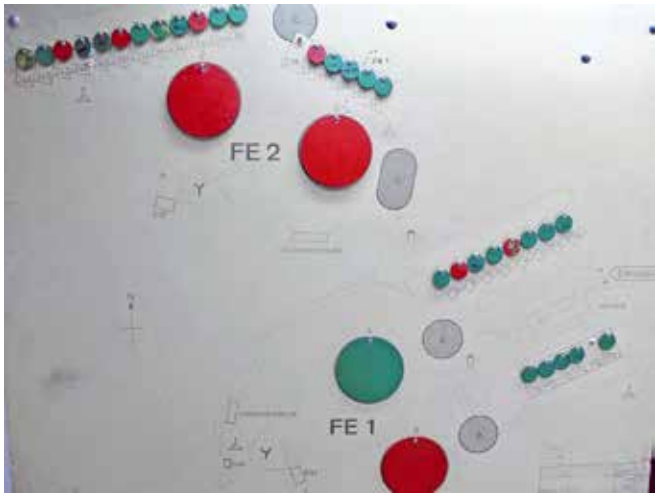
07: Launcher Group D

08: Launcher Group C

A cabinet panel removed to reveal some of the heavyweight electrical engineering within the illumination radar building

The blast doors at the entrance to the control authority and operations centre bunker (05 & 06 on the plan)

The compact FE2 control authority office (05 on the plan). The missile status board is visible on the left. The steel doors lead into the adjacent operations centre room



The missile status board in the FE2 control authority room. This shows the two Fire Units, FE1 (Launcher Groups A & B) and FE2 (Groups C & D) with their associated magazines and infrastructure. The Y symbols are the illumination radars; the outline buildings marked EIST are the control/operations centres; those labelled STROMVERSORGUNG the power stations

The power station for Fire Unit FE2

The electrical control panels in the FE2 power station

These were the two launcher groups of FE2, each with four launch pads. They supplied the guided missiles with electricity, conditioned air, hydraulic oil and control signal inputs until they were fired.

A pair of Bloodhounds of Launcher Group C (08 on the site plan) protect the pastoral tranquility of the Swiss Canton of Zug

09: Guided Missile Magazine

Each Fire Unit had two sets of magazines containing the Bloodhound missile. The magazines were air-conditioned. This pair served FE2.

10: Loading Vehicle

The loading vehicle was used both to transport the Bloodhounds and other materiel within the site and for loading and unloading the missiles at the launch pads.

11: Transmission Building

The transmission centre provided microwave, radio and telephone communications for the entire site.

12: Collimation Tower

This was located outside the missile site and used to check the function of the illumination radar. Its antennae could be used to simulate targets and transmit electronic interference signals.

A Bloodhound on its launcher, with the FE2 illumination radar building (marked 04 on the plan) in the background

The Bloodhound FE1 missile magazine adjacent to the personnel shelter (not in view) marked 01 on the plan

SOURCES & NOTES

My visit to the Gubel Bloodhound Site was made as part of the joint Coast Defence Study Group (CDSG) / Fortress Study Group (FSG) Study Tour to Switzerland in August 2018.

All photographs were taken by the author, unless stated otherwise.

[1] Wikipedia: Bloodhound (missile)

[2] For more technicalities of the Bloodhound Mk.II operating system see www.subbrit.org.uk/sites/wattisham-mk2-bloodhound-missile-site Catford, N. *Wattisham Mk2 Bloodhound Missile Site*, Subterranea Britannica, July 2006

[3] Wikipedia: Royal Air Force Squadron histories

[4] Major Richard Ho RSAF (Retd), *Can do spirit among pioneering officers helps fuel RSAF's growth as it marks 50th birthday. The Straits Times*, 1 September 2018

[5] Wikipedia: List of aircraft of the Swiss Air Force

[6] Visits to the Gubel Bloodhound site BL-64-ZG are by pre-arranged guided tour only.
Contact details:

www.bloodhound-museum.ch
www.mhsz.ch
Email: bloodhound@mhsz.ch
Address: BLOODHOUND
c/o Zug Tourismus Bahnhofplatz CH-6304 Zug
Tel: 041-723-68-00

Fiddler's Ferry - an Early Retirement

Iain Taylor

Fiddler's Ferry from the East. Photo Iain Taylor

Fiddler's Ferry power station lies on the banks of the River Mersey near Warrington and was the second of seven 2,000 megawatt (MW) capacity coal-fired power stations that were released for construction between 1960 and 1964. Originally built for the Central Electricity Generating Board, the site is now owned by Scottish and Southern Energy (SSE); the fourth owner since privatisation of the industry in 1990.

Most power stations aren't underground of course (though a fair few especially hydro ones are) but the coal they burn definitely is. At their peak in the 1970s, Britain's coal-fired power generated around ninety percent of the UK's energy needs. With a government deadline of 2025 (now likely to be brought forward to 2024) for the complete phasing-out of coal power stations in the UK, SSE took the decision to close Fiddler's Ferry by 31 March 2020.

English Electric generator rotor during maintenance. Photo SSE Energy Services

Only three of the four generating units were in use at the time of the announcement due to a lack of contracted electricity demand and the fact that Number 1 Unit could only ever be run using very expensive low-sulphur fuel.

Questions and Answers

It seemed time was running out to organise a visit for Sub Brit members before these mighty structures became consigned to the history book. Despite its having a well equipped and staffed Education Centre and nature reserve, visits to the power station site itself have rarely been allowed in recent years. With a limited window of opportunity a visit was arranged in November 2019; in fact this turned out to be one of the last visits permitted.

ERC & nature reserve close to generation site. Photo David Thompson

Our visit started by meeting up off-site and travelling to the Educational Resource Centre (ERC) by coach. Here our guides gave a presentation about SSE, electricity generation and the site itself. Inviting questions, they soon realised difficult topics were the norm for a Sub Brit group - their target audience is normally primary school children.

The guides adapted well to the probing questions thrown at them. Knowing we would generally have a technical background, they had arranged for one of the Process Engineers to come in and answer some of our harder requests. He openly admitted that this wasn't the sort of thing he normally did before leading a pleasantly informal and very interesting session on the operation of a power station. Again, no questions were left unanswered.

ERC workshop room. Photo Phil Catling

Photography is not permitted on the generation site and despite their best efforts our guides weren't able to have that policy relaxed during our visit. SSE are committed to recording the site fully for the Historic Environment Record and that should be available publicly once the site is decommissioned.

After the Q and A it was back on the coach for entry to the generation site and our tour.

Party heads back to the coach for the tour. Photo Phil Catling

Travel in a full-size coach limits the route and therefore the parts of the site which can be viewed easily. This meant we wouldn't be able to visit the Flue Gas Desulphurisation Plant area. On the other hand it did mean that we could make places available for twice as many members as we would otherwise have done.

It was possible to alight at the coaling plant and also to visit the main control room. Visitors are not permitted into the turbine hall but with its full-size glass doors and a few staff going in and out a sneak peek was possible.

English Electric generator and turbine set. Photo SSE Energy Services

Design and Construction

The site was chosen back in the Sixties as there was a large area of reasonably flat land, a ready supply of process water, good transport (train) links and a large local demand for electricity, being close to Warrington, Liverpool and Manchester. The 2,000MW stations each had four generation units, each with a nominal output of 500MW.

Process water intake on the River Mersey. Photo Iain Taylor

For the first time power station design was explicitly required to take into account environmental considerations. To a modern eye it seems strange that the design of such massive sites and structures involved such consideration but a closer look reveals both a symmetry of construction and some of the original landscaping.

The chief architect of Fiddler's Ferry was Gordon Graham (of Architects' Design Group) and he was praised at the time for providing the best design of all those submitted for the various stations to be built. The Ministry of Power (in a tone which would probably not be used today) said 'the imposing dynamic bulk' power station should provide 'a suitable termination to the squalid industrial area of Widnes'!

The aesthetic value of all the power station plans was assessed by the Royal Fine Art Commission. Their only criticism of Graham's submission was that yellow bands painted on the cooling towers would look incongruous. The painting was shelved and the plans fully approved in November 1963.

International Combustion coal pulverisation ball mills. Photo SSE Energy Services

The main building contractor, the Cleveland Bridge Company, commenced work in 1967. Better known for bridge construction, their portfolio includes the Forth Road Bridge and the Queen Elizabeth II Bridge across the Thames at Dartford. In 1971 the first unit supplied power to the National Grid and in 1973 the site was run up to its full output capacity (1,989MW) for the first time. A single 650ft concrete chimney is placed centrally at the east of the main block.

Cooling Towers

The Yorkshire Hennebique Contracting Co. of Leeds constructed eight standard height (374ft) cooling towers in mirrored lozenge formation, four at each of the north and south end of the main building. Due to a flaw in its construction one cooling tower collapsed during high winds on 13 January 1984. A replacement was built in its place and on close inspection the concrete finish is discernibly different.

Southern lozenge from the lagoon site. Photo SSE Energy Services

Each tower can cool 8,400 litres of water per second so efficiently that in cool weather atmospheric moisture freezes on the lower external structure. Cooling water is pumped from the River Mersey upstream of the power station, from here enters a settling lagoon before being filtered, treated and entering the circulating cooling system.

The cooling ponds below the towers stay at a constant warm temperature and this led to an unusual addition adjacent to the northern towers in the 1980's when a local company installed a commercial fish farm and associated filtration equipment. Carp and later American Stripped Bass were raised from spry to restaurant size. Though some of the equipment remains fish are no longer farmed in the pond.

Northern lozenge from the gateway. Photo David Thompson

Black Start.....

A 'Black Start' is the controlled re-establishment of power generation without drawing on an external supply. Power stations need electricity to run; initially this has to come from another source and so a few stations have the extra equipment to start small-scale generation and slowly build to full power rather than draw power from the National Grid.

Nowadays hydro-electric stations are the prime source for a Black Start but Fiddler's Ferry maintained its contract because a large station is better for load balancing than the usually small hydro stations.

From initial design the station was provided with Black Start capability using two gas turbines (Rolls-Royce Olympus jet engines) and generators capable of delivering 35MW of power. The gas turbines are themselves started from a large collection of lead-acid cells which are kept fully charged. This battery bank also operates critical safety systems in the event of main power outage.

Black Start facility. Photo Iain Taylor

Since 1973 the station has only completely shut down once. This was a result of the Miners' strikes of 1974. The station switched to oil-firing for a short time but blockades prevented oil delivery as well and all units

were shut down. The Black Start capability was used for restarting the station thus ensuring enough power was then available to the National Grid to restart other power stations. During the 1984 Miners Strike the station operated at a reduced output but coal supply from the Nottinghamshire fields was sufficient to prevent a total shutdown.

.....and Black Gold

As built the station burned British coal, mainly from the South Yorkshire coalfields, but as emissions of sulphur in exhaust gases had to be reduced, coal from other sources was brought in. This coal is blended to give peak burn efficiency and a consistent sulphur level. With one of the only large-scale blending plants in the UK, there were trains bringing coal into the site but also going out again for some time to supply blended coal to other stations.

Birtley Engineering twin road automatic coal discharge plant. Photo SSE Energy Services

In 2002 the UK Government introduced an Order which would force generators to use a percentage of 'renewable' fuel (or pay a climate levy) so that it could meet targets agreed by the Kyoto Protocol. Successful trials took place in 2003 to examine the possibility of co-firing by injecting biomass into the fuel stream. This led to the construction of a biomass handling and milling plant and injectors being fitted to Units 2 and 4.

Station model in the ERC gallery area clearly showing the three FGD units. Photo David Thompson

More stringent sulphur limits coming into force also meant the addition of Flue Gas Desulphurisation (FGD) Plant being required for the station to continue running. Limestone/gypsum FGD plant, using a separated over fire air (SOFA) system, was fitted to Units 2, 3 and 4 between 2006 and 2008 at the same time as the biomass injection system. After this, Unit 1 was only used with very low sulphur fuel and, due to the expense, only for winter contracts.

If the closure hadn't been announced it is likely that Units 1 and 3 would have had biomass injection equipment fitted as well. This would then have been followed by the addition of selective catalytic desulphurisation on all units. The gypsum produced by the FGD has to be a consistent quality, which dictates the sulphur content of the fuel blend, and is sold under contract to British Gypsum.

A side effect of the rapid reduction in UK coal-fired power stations will be a shortage of high quality gypsum for the building industry in the UK. This will have to be offset by imports of gypsum and therefore increased energy consumption!

Merry go Round

Class 66 on merry-go-round. Photo SSE Energy Services

During the visit we saw the 17.5 million tonne capacity coal yard – roughly sufficient for two years of operation. The merry-go-round (MGR) delivery system was designed to automatically discharge 1,000 tonnes of coal per hour from freight trains. The MGR is a train of hopper wagons that discharge while still on the move. The change to modern larger coal wagons didn't require any major changes to the system.

Coal delivery, crushing and blending is controlled from a dedicated centre adjacent to the coal yard. Here the operators explained where the coal was from and how it was processed. No conveyors were running during our visit but we could see the depression in the stockpile from where an underground conveyer fed hoppers for each unit. The surface of the stored material is kept densely packed to prevent water ingress and self-ignition.

Each unit burns 4,800 tonnes a day at full capacity. As coal is classed as a controlled hazardous waste, SSE were aiming to use all of the remaining coal before the absolute closure date of 31 March instead of paying for disposal.

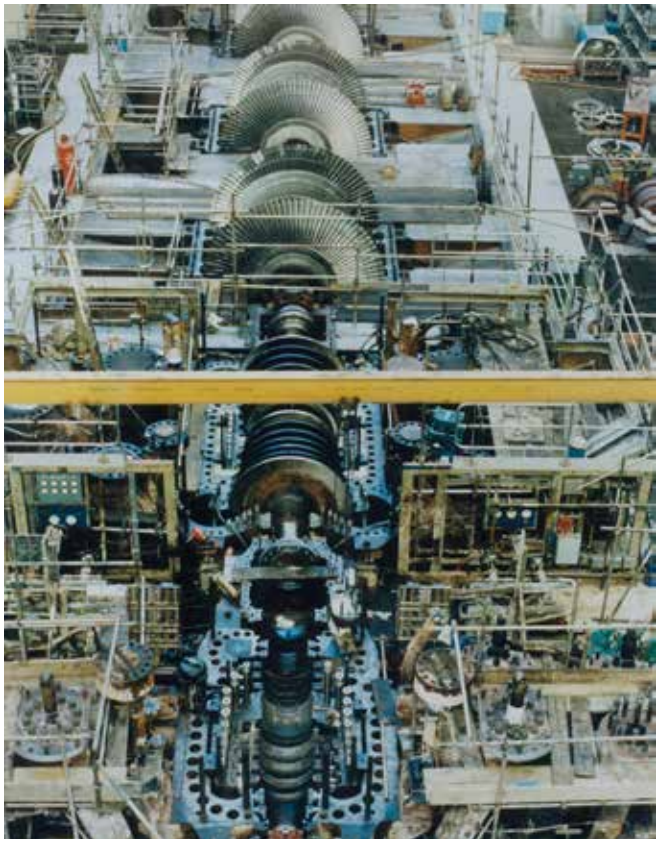
Engine approaching the hopper house on the MGR. Photo Les Fifoot

Original MGR hoppers with later canopy modification. Photo SSE Energy Services

Though there was no contracted demand for the electricity some money would be recovered by selling to the National Grid. Despite there being no deliveries for almost two years there was still sufficient coal to run three units until March 2020. In round figures we were looking out over three million tonnes of coal – roughly a hundredweight (in 'old money') for everyone living in the UK!

When we asked why the coal couldn't be sold off, the answer was that it wasn't economic. The coal would have to be manually loaded into trailers, driven to a port, unloaded into ships and then the reverse in Germany (which has made the decision to build new coal-fired stations rather than close them all) as there was no market in the UK.

During our visit we learned that one unit had been temporarily shut down due to vibration caused by a damaged turbine blade. This is the first time in at least 35 years that a blade had failed during operation. The turbine and generators were supplied by English Electric. Since our visit the unit has been brought back on line in order to burn more coal.



Turbine stages. Photo SSE Energy Services

Control Rooms

In the large and spacious main control room are control positions for each individual unit, staffed by a Unit Leader, plus a spare control position. The coaling plant controls are also duplicated here in case of emergency. During the 1970s the CEGB developed its own fail-safe computer system for use in power stations to replace the older analogue controls.

Computer Users Technical Languages and Application Software System (CUTLASS) was very easy for non-engineers to master. After privatisation most stations paid for a new system developed specifically for them by Thales. This new system is now largely obsolete as it cannot integrate well with older or newer process controllers.

Fiddler's Ferry didn't change to the Thales Advanced Plant Management System, but instead uses a re-write of the original CUTLASS system called PT-Cutlass Kit 9. This has proved more resilient with full backwards compatibility, easy integration of newer modules and industry standard communication with external systems.

The current 'Kit-9' supervisory control and data acquisition (SCADA) package supplemented by video monitoring allows every aspect of the operation to be monitored 24/7 both locally and remotely. The control room operators were happy to answer any questions and show parts of the system in action. Despite many of them facing redundancy they were clearly very proud of their station.

We could easily have spent more time here but our guides were keen to move on. The original control room – built towards the centre of the building for extra protection during the Cold War – still exists. Whilst it looks very dated with big analogue gauges, filament bulb indicator lights and rotary controls it is fully functional and if required could be used to control the station. Two of the current control room staff had actually used parts of it. Some of our party were able to visit and this was a highlight, especially as it is normally off-limits to visitors.

Lentjes UK Ltd FGD equipment in front of main buildings. Photo Michele Clement-Delbos

The Future

It's a bit much to hope that a whole 2,000MW power station will be saved as a monument to the fifty years that they provided the bulk of our electricity. Perhaps a cooling tower could be secured? To date no natural-draught cooling tower has been given Listed status. Those at Didcot were considered and demolished, the five at Willington were rejected for listing (though they have escaped the explosive charges so far). Time to try again with at least one from Fiddler's Ferry?

After closure the site will be decommissioned and demolished. It was thought that SSE might choose to build a Combined Cycle Gas Turbine power station on the site but they have already ruled that out and will sell the land. The resultant brownfield site has been touted as an area for housing development and/or new industrial development.

For many years coal powered most of the UK and supported a coal mining industry still employing 300,000 people in the 1970s. Today less than 3% of the UK's electricity supply comes from coal. As you read this there will only be four large coal-fired power stations left running…...possibly just three:

The Future

Drax Units 5&6 - will cease using coal in March 2021 and the units will be replaced by gas ones after September 2022

Kilroot - limping along and could close at any moment

Ratcliffe-on-Soar - no plans to close before enforcement

West Burton - capacity contract until September 2021.

Most recent closures:

Aberthaw B - de-synchronised 13 December 2019

Fiddler's Ferry - de-synchronised week commencing 2 March 2020

It just remains to thank SSE and specifically all of the guides and staff involved in our visit. We were made most welcome by everyone we met and all were happy to stop and talk about their roles and the operation.

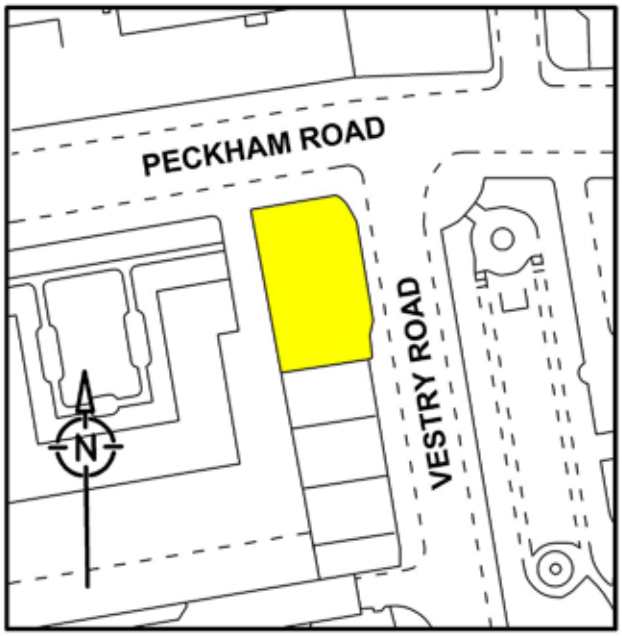
(*Editor's note* – and of course grateful thanks to Iain for arranging the trip and sharing his knowledge of the site in this article).

Coal storage yard after closure showing small amounts of residual coal. Photo Iain Taylor

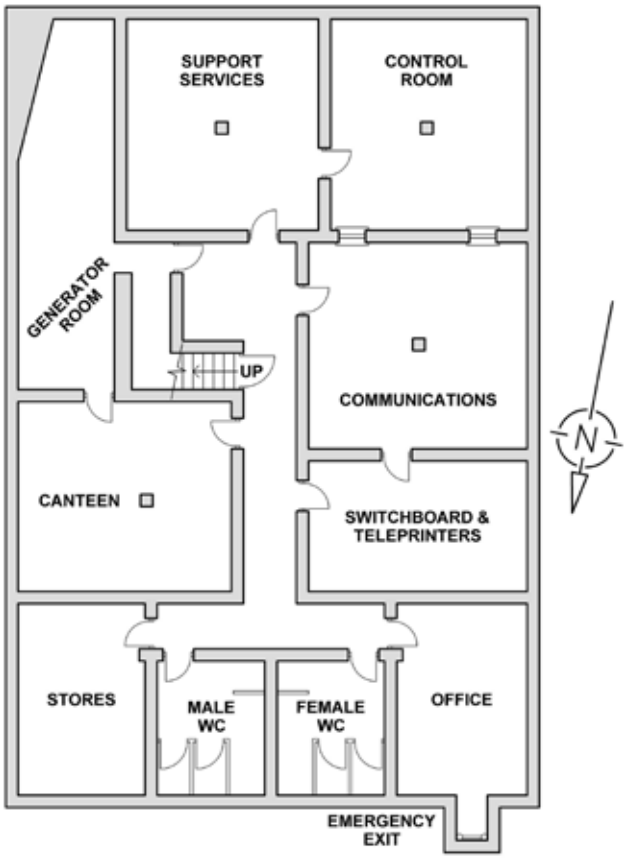
Southwark Borough Control, Southeast London

Nick Catford

Control Room - many of the wall mounted maps survive but in poor condition as the bunker is now very damp. A sign from the door saying Room No 2. Control Room *lies in the water in front of the pillar.*



During the Cold War, London was divided for defence purposes into four (later five) groups, each reporting directly to Kelvedon Hatch; in turn each group was



SOUTHWARK BOROUGH CONTROL

Drawn by Tim Robinson

subdivided into the individual boroughs, each of them having its own control centre.

Visit in 2001

The South East Group War HQ at Peartree House, SE19, had six sub-controls, Greenwich, Bexley, Bromley, Croydon, Lewisham and Southwark. The Southwark control - designated 51C5 - was a bunker located beneath a health centre at the junction of Peckham Road and Vestry Road, SE5, almost opposite Southwark Town Hall. In August 2001 I was able to make a visit.

After closure, the health centre was demolished in the late 1990s because, according to the Southwark EPO, local children kept breaking into it. Following this demolition, the stairs down to the basement were partially removed with a new concrete lined shaft down to the the few remaining steps. Two hinged metal grilles were fitted to the shaft. At the time of my visit, the site was still owned by Southwark Council but the plot of land was for sale and awaiting redevelopment.

The land was sold in 2001 and it was assumed by the Council that redevelopment of the site would follow in due course. An attempt was made to gain planning permission in 2005/6 but nothing came of this and since then the site has remained derelict, although still fairly securely fenced.

Local concern

I was contacted by the Planning Department of Southwark Council in February 2020. The Council and local residents are now concerned that nothing has happened for such a long time. Council staff now want to enter the bunker to assess its current condition and learn more about its construction, thickness of the slab and level of reinforcement.

They are also attempting to contact the owner to find out why the site has remained derelict and undeveloped for nearly twenty years. Southwark Council has no information about the bunker other than a plan that is reproduced here.

I am repeating my visit report from 2001 together with a series of photographs, many of which which haven't been published before.

2001 site visit

One side of the stairway into the bunker below has been filled with concrete leaving a six foot drop onto the steps. Two hinged grilles have been fixed over the remaining part of the stairwell and this is kept securely locked. Corrugated metal sheets have been placed over the grille.

At the bottom of the entrance steps a wooden gas-tight door opens into a lobby area. A short corridor runs north. The door into the kitchen is seen. Doors and frames are all painted light blue

At the bottom of the stairs there is a heavy wooden door giving access to the middle of the long arm of a T-shaped corridor. All the fluorescent lights were on throughout the bunker despite several inches of water on the floor. Presumably the lights had been on for several years! A second wooden door lies on the floor in the corridor; it is unclear where this came from, perhaps the top of the stairs. Turning left the corridor opens out into a small lobby area. To the left of the lobby there is a door with a plastic sign on it that says 'Generator Room' (all the rooms have similar plastic signs on the doors indicating their use). The irregularly shaped room houses a 16 HP two-cylinder

3 phase Lister Generator to the left of the door and ventilation and filtration plant and electrical switchgear and control cabinets (made by Melvin Gerin) to the right. The lights on the control cabinets were on. I switched on the ventilation equipment and for a few seconds it started up before tripping a circuit breaker which plunged the bunker into darkness. After resetting the circuit breaker the lights came on again.

The Lister generator partially hidden by fallen ventilation trunking. A locked door into the kitchen is hidden behind the generator

The ventilation plant and electrical switchgear. A small red light can be seen on the smaller cabinet indicating that the power was on

A door behind the generator gives access directly into the canteen but this is locked. Next to the generator room at the end of the long arm of the T is a room with a sign on the door that says 'Room No 1 Support Sections'. The room contains a central supporting pillar in the middle and various wall maps, now badly decayed. A large plastic message-handling flow chart lies abandoned on the floor.

Room No 1 Support Sections (Services). Note the door directly into the Control Room. The only access to the Control Room is through Support Services

Can the maps be saved?

From Support Services another door leads directly into 'Room No. 2 Control Room', there is no access into the Control Room from the corridor. The room contains decaying large-scale wall maps along two walls: one is labelled 'Incident resources' and another labelled 'Incident Map'; this also shows rest centres. There is a large chart labelled 'Board Plot' divided into five columns with the headings 'Time', 'Location', 'Action', 'Resources', 'DEPL' and 'ETR'.

Control Room with two message hatches into the adjacent Communications Centre; incoming messages left and outgoing messages right

There are two windows into the adjacent room labelled 'Incoming messages' and 'Outgoing messages'. This room has 'Room No. 3 Comcen - Communications staff only' on the door. The room has five acoustic booths for telephonists along one wall with signs above reading 'SE Group flood net', 'Borough net', 'Raynet', 'Tele Op. 2' and 'Tele Op. 1'.

Obsolete equipment

There is another message-handling flow chart and a board labelled 'Communications state'. This is divided into nine columns with the headings 'UHF Emergency Borough net', 'UHF standby', 'Housing net', 'Raynet', 'VHF', 'FAX 0171 701 7286', 'Phone 1 4660', 'Phone 2 4661', 'Phone 3', 'Teleprinter 1' and 'Teleprinter 2'. A supporting pillar in the centre of the room bears a sign that says 'Filing & Progress Chaser'.

Room No 3 Communications Centre (Comcen). Only communications staff are allowed into this room. The two message hatches from the Control Room are again seen

Acoustic booths in the Comcen

The next room along the long arm of the T is 'Room 5 Switchboard and Teleprinters' that also has a door directly from the Communications Centre. It has an office desk with an 'Autex Telex Manager' alongside three acoustic booths. Various BT junction boxes adorn the wall and a computer monitor and keyboard and printer lie on the floor.

On the opposite side of the corridor alongside the entrance stairs is 'Room No. 4 - Canteen' with a serving counter and various wooden cupboards. All the kitchen appliances have been removed apart from the water heater. A door into the generator room is locked.

Did the staff sleep on the job?

Along the short arm of the T corridor 'Room No. 6' is at one end. There is no other indication of the use of this room although it may well have originally been a dormitory. In later years the dormitories in control centres were often taken out of use and the rooms used for other purposes; the Council plan shows it as a office. The room now contains a number of filing cabinets still containing files and numerous papers. There are also several chairs and a low table.

Canteen

Main corridor looking towards the entrance stairs. A wooden gas-tight door lies on the floor, this probably came from the top of the stairs. The door into the canteen is on the left with doors into the switchboard room (nearest) and Comcen on the right. The door at the end is Support Services

At the far side of the room behind a curtain is the emergency escape shaft consisting of a fifteen-foot vertical ladder to an ROC-style hatch. Although the hatch is still in place and visible from below there is no sign of it on the surface so it has clearly been covered over. There is a long framed (and behind glass) 'family tree' style chart on the wall with the heading 'Organisation London Borough Wartime Headquarters'. At the head of the tree is the Borough Controller (Staff Officer Young) and under him the Deputy Controller (J. Parker) and the Assistant Controller Support Services (Cammies) and so on down the line.

Flush with success

Next to this room are the male and female toilets with all their fittings intact apart from sinks which have been removed. Surprisingly, the toilets still flush and the hot-air hand driers still work.

Shown as an 'office' on Southwark Council's plan of the bunker, this room contains the emergency exit with a ladder to the surface

The 'office' seen from the base of the emergency exit shaft

The final room at the opposite end of the short arm of the T is the 'Store'. It is fitted with Dexion shelving and has a number of items still in place including a large battery

The gents' toilet, comprising two flushing WC cubicles and a urinal. The hand basin on the left has been removed

Designated as a 'store' on the council plan this room and the office may have originally been male and female dormitories

and charger, various small power supplies, tins of paint, vacuum cleaner, various empty equipment boxes and an IBM 72 Golfball typewriter.

Throughout the bunker there is rubbish strewn but surprisingly, considering its location and the fact that it was open for several years, it has not been trashed and vandalised. There are several inches of water on the floor, probably from rain coming through the open surface grille.

There is a fairly pungent and unpleasant smell (not toxic) and the atmosphere is muggy and close - this was made worse when the wooden door at the bottom of the stairs was closed. All the doors, frames and cupboards are painted light blue.

It is nearly twenty years since my visit. It will be interesting to see what becomes of this site, one of the last containing memories of the Cold War.

When I visited in March 2020 little had changed externally. It wasn't possible to enter the site so it is unclear if the access shaft has been filled in or securely capped

All photos Nick Catford

Under the Surface:

Mining and Quarrying around Maidenstone Hill, southeast London

David Whittaker

Maidenstone Hill lies in Blackheath in the London Borough of Greenwich (London SE10).

Extensive quarrying (here defined as open workings) has taken place on and around Maidenstone Hill; mining (underground workings) may also have occurred, although conclusive evidence is limited. Various records refer to loam, soil, earth, sand, stone, flint, gravel, 'shingles' and 'ground', although the most important was likely to have been chalk. The indicative locations of sites where mining and quarrying is known to have occurred can be found on the map.

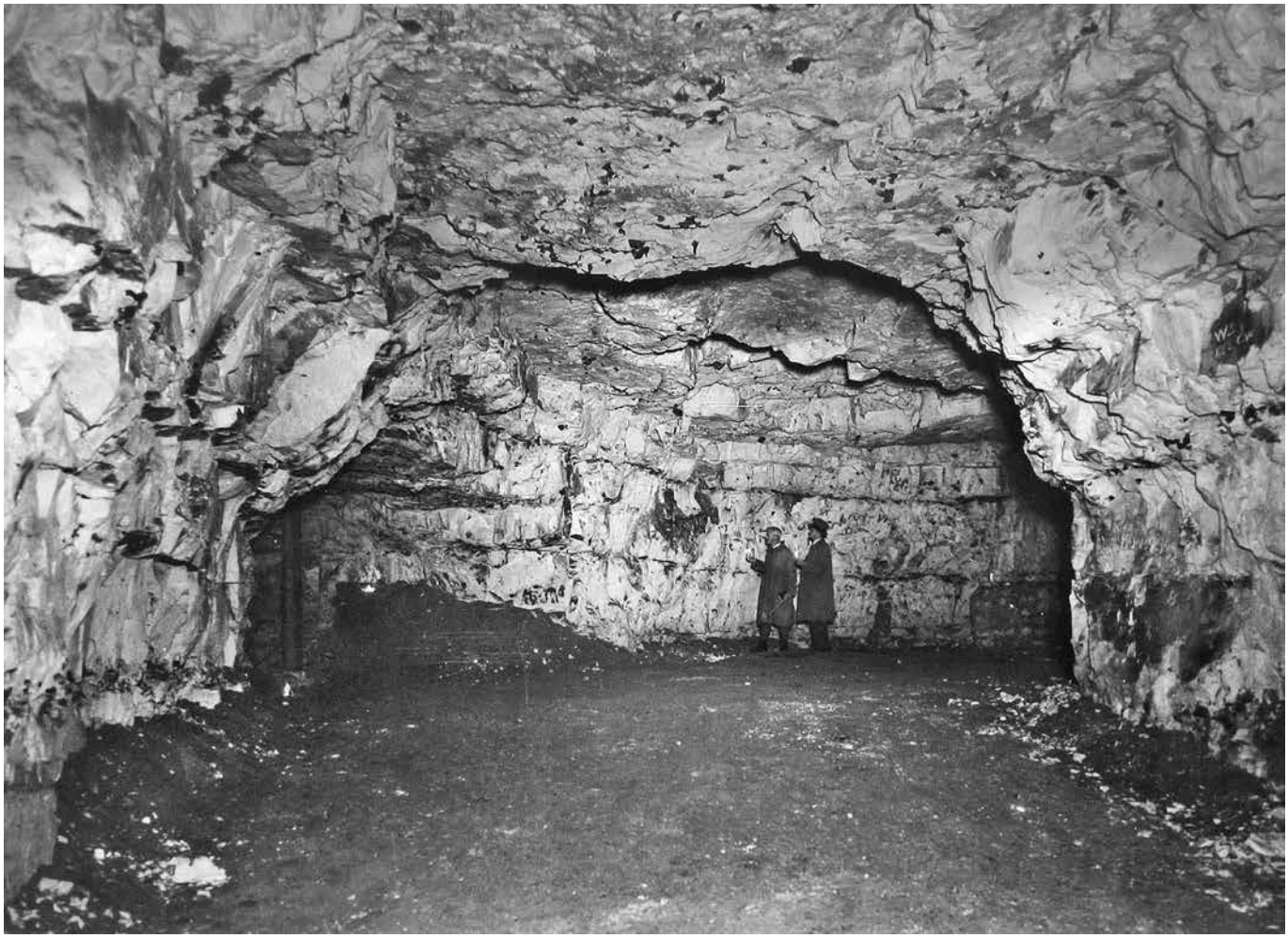
Sixteenth-century beginnings

The earliest record of mineral extraction around Blackheath Hill – not necessarily on Maidenstone Hill - dates from 1590, when chalk was being taken. The Blackheath Cavern (also known as Jack Cade's Cavern - see *Subterranea* 29, April 2012, page 58) may have been used for chalk mining, but this is not certain, nor is its age. The Cavern was (re) discovered in 1780, so is older than that date at least.

As all mining and quarrying activity predates Ordnance Survey mapping of the area, even where records do exist the quality of descriptions and plans generally make it difficult to plot the locations accurately, if at all, although the accessible sections of the Blackheath Cavern were surveyed in detail in the 20th century.

Records, including mapping, were issued by Morden College after taking possession of a large part of Maidenstone Hill in 1699; these became more detailed in ensuing years. The College was also quite meticulous about the issuing and recording of leases on the hill, including those relating to mineral extraction. A map dated 1772, which can be found on p. 59, gives a useful and relatively accurate indication of the location of some of the later workings on the hill, including two chalk pits. A study of current topography can also assist.

The survey of the Manor of Old Court by Morden College in 1771 suggests by the shading used that much of the area now bounded by Blackheath Hill, Point Hill, Winforton Street, Blissett Street and Plumbridge Street had been dug at some point.



Blackheath Cavern, main chamber, in 1939. The Cavern may have been a chalk mine, but there is no conclusive evidence. Photo from the Greenwich Heritage Centre

Quarry Faces and Disputes

From the evidence available, it appears that the outer edges of the hill, at the edges of what is now the open space of The Point, were cut away from roughly where Westgrove Lane joins Point Hill, around to the rear of the 'Undercliff' block of flats at the junction of Maidenstone Hill and Blackheath Hill, and up towards Point Close.

Further down, other parts of the hill were cut away: below Trinity Grove the remains of a quarry face can still be seen - this may have extended up to Point Hill as there is evidence that there was a steep drop to the north of what is now Dutton Street, and eastwards below Maidenstone Hill (the road). Just outside the study area to the south of Blackheath Hill there are also the remains of quarry faces.

A legal document (sadly including no maps) dated 1751 relating to the property disputes between The Crown and those it considered to be illegal occupiers of the hill, including Morden College, includes a number of critical references to the extraction of various materials from the hill, dating from 1681. The document states that the extent of workings on the hill was such that there were 'subterraneous cavities' caused by 'soil dug up and carried away' and that 'the soil thereof having been broke up damaged and defaced in a most shameful manner'. There is a reference to the Steers family (further information on them can be found below) stating that they 'have dugg up every part of the hill'.

The document is referred to as 'the 1751 document' below; it also refers to the damage done to the Gang Lane water conduit by digging. Legal extraction of minerals on Maidenstone Hill had probably ceased by 1751 on the commencement of action by The Crown against Morden College, although the remaining quarrying leases did not expire until 1760. The Act of Parliament of 1771 that settled the dispute between the Crown and the College specifically forbade the extraction of minerals; this provision was written into later leases for building land.

Although there are some later references to workings in the area, they may not have been on Maidenstone Hill itself. The Transactions of the Geological Society of London, dated 1817, for example, referred to 'pits of sand and chalk on Blackheath Hill'.

Illegal removal of sand and gravel in particular is recorded by Morden College up to at least 1844, when tenants complained about such activities taking place on The Point. Extraction was not limited to Maidenstone Hill - it also took place to the north and south of the study area. Legal extraction to the south of Blackheath Hill continued until the mid-19th century. Further information can be found in the 'South of Blackheath Hill' section below.

The Steers

Of those who dug from Maidenstone Hill, the Steers (the spelling varies slightly between records) family are the most frequently-mentioned in documentation – including involvement in a number of disputes. The family extracted chalk (and other minerals) and burned lime for at least three generations – William from the second half of the 17th century, then his widow Hester with his son Thomas, and finally grandson Innocent, to the middle of the 18th century.

William was variously described as a 'limeburner', 'lime merchant' and 'lime worker' in the Parish Records of St Alfege in the late 17th and early 18th centuries, and Thomas as a 'lime burner'. Innocent is also referred to as a 'limeburner'. There is a reference in a 1782 deed for a property on the south side of Blackheath Hill to a Jane Steers, 'a lime merchant of Lewisham', who may have been related.

The Steers were the owners of the enterprises; records of those who worked for them cannot be found.

To understand the mining and quarrying activity in and around Maidenstone Hill it is important to understand the geology of the area; this is covered below.

Geology

The Hill forms part of the edge of the Blackheath plateau, running for about seven miles through southeast London. The geology of Maidenstone Hill has heavily influenced the development of the area. The British Geological Survey (BGS) divides British geology into '**superficial**' and '**bedrock**' categories, with sub-divisions of each. Further information, including mapping, can be found here:

http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Superficial

The BGS defines 'superficial' deposits as 'the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 2.6 million years from the present. They rest on older deposits or rocks referred to as bedrock'.

The study area includes part of a larger area of superficial deposits, which can be found to the west of Maidenstone Hill (the road). These are classified by the BGS as 'sub-aerial slopes', that is, formed on the earth's surface rather than under water; they comprise sedimentary detrital deposits of clay, silt, sand and gravel, and form 'down-slope layers and fans of accumulated material.' The deposits have no specific name in this locality.

Bedrock – from the top down

1. The uppermost level of bedrock in the study area covers the higher part of The Point and comprises part of the Harwich Formation - sand and gravel. This is a sedimentary bedrock, formed approximately 48 to 56 million years ago in the Paleogene Period, in a shallow sea.
2. Below the Harwich Formation is the Lambeth Group - clay, silt and sand. This comprises the upper level of bedrock around the lower western edges of The Point and is also sedimentary bedrock formed in the Paleogene Period, approximately 48 to 59 million years ago, in an area of swamps, estuaries and deltas.

3. Below the Lambeth Group are the Thanet Formation - sands. These comprise the upper level of bedrock in the area to the west of The Point. This sedimentary bedrock was also formed in the Paleogene Period, approximately 56 to 59 million years ago, in an area of shallow seas.
4. Below the Thanet Formation are the Lewes Nodular/ Seaford/Newhaven Chalk Formations which comprise the upper level of bedrock further to the west, in the lowest part of the study area.

All layers were exposed or just under the surface of the ridge and were relatively easily accessed by miners and quarriers; sand, gravel, chalk and other materials were taken from the area in and around Maidenstone Hill from at least the 15th to the mid-18th century. This left deep scars above and below the surface, significantly changing the natural topography of the area; although many of these were later levelled to allow development and redevelopment for building, traces of the earlier activities remain.

The local geology also created a spring line, where water passing through the upper porous formations met impervious clays. For certain in the 17th, 18th and part of the 19th centuries, and possibly earlier, a number of springs (either three or four) could be found just below The Point; these supplied water to Greenwich Hospital as a part of an extensive network of conduits. A spring was also recorded in the rear garden of 35 Maidenstone Hill in the 1840s.

Extracted Materials – Main Types

The main types of material removed from Maidenstone Hill are detailed below. References to mining and quarrying activities are made in chronological order in each section.

Earth

The mention of 'earth' is likely to be a reference to the use of material from the hill to facilitate construction works elsewhere in the locality. Prior to building works on what was heavily-pitted ground, much levelling was required and no doubt significant amounts of earth and possibly stone required moving away from the hill. As an example, when Deptford Bridge was partly reconstructed by the New Cross Turnpike Trust in 1788, it required, amongst other things, '…110 loads of earth from Blackheath Hill.'

Flint

Flint is most commonly found as layers in chalk and limestone. In the 18th century it could be used in building, in the ceramics industry, in flintlock firearms, or in tinderboxes to help create a fire. The New Cross Turnpike Trust used local sources to make and repair roads; and the perimeter walls of Greenwich Workhouse, then on Maidenstone Hill, were topped with 'flint glass' in order to try to prevent escapes. References to the extraction of flint can be found in the 'Chalk' section below.

Sand

Depending on the quality of the sand, it could have been used for a multitude of purposes. These include in the building industry, for forming moulds for casting metal, for making glass - there were at least four 'glasshouses' (glass factories) in Greenwich in the 16th and 17th centuries - or for use in scouring floors, hearths, steps and even crockery in the home. Given the proximity to areas of chalk extraction and limeburning, it is likely that some of the sand was combined with local lime to make mortar.

There is a reference in the 1751 document to sand, loam and gravel pits 'on the northwest side of the [Maidenstone] hill,' in 1683, probably that area around the junction of Maidenstone Hill and Blackheath Hill. There is a sand pit marked on a map that is undated (but known to be earlier than 1739), approximately where 20 Maidenstone Hill to 85 Dutton Street are now located. Greenwich Hospital reported in 1707 that Thomas Steers was digging sand on Maidenstone Hill.

According to the 1751 document, in 1724 Thomas Steers was 'digging and carrying away gravell, sand and stone' (he was supplying material to the New Cross Turnpike Trust) and in 1735 others were 'digging and carrying away soil.' Innocent Steers is also mentioned, for 'digging and carrying away the gravel, sand and soil of Maidenstone Hill.'

A Matthew Robinson was granted a lease by Morden College from 1737 to 1758 to dig sand. The description of the site suggests that it was located around the junction of Dutton Street and Trinity Grove. However, Robinson was reported in a newspaper article dated 1739 as being bankrupt, so may not have been able to complete (or even start) his proposed works. The article described him as '... of Greenwich, brick-maker, lime-maker and chapman.' A 'chapman' was a merchant, especially an itinerant one.

Innocent Steers was granted a lease to mine sand 'on the north side of Maidenstone Hill' from 1740 to 1760, although this may have been terminated prematurely given the dispute between Morden College and the Crown.

There are a number of references in leases granted by Morden College in the late 18th and early 19th centuries in what is now the Dabin Crescent and Trinity Grove areas to '...hilly ground formerly used as sand or gravel pitts...'

There are well-preserved remains of a sand mine under the south side of Diamond Terrace, just outside the study area. It is not certain how old the mine is.

Loam

This is a type of soil made up mostly of sand, silt and clay. The proportions of each of these minerals will determine the use to which loam can be put. Loam can be used in agriculture and gardening to improve the quality of soil; and can also be used to make bricks.

As mentioned above, there is a reference in the 1751 document to sand, loam and gravel pits 'on the northwest side of the hill,' in 1683, probably that area around the junction of Maidenstone Hill and Blackheath Hill. In 1739 a lease was granted to Innocent Steers for the mining of '...chalk, flints, sand, gravel and loam', on a site located in the area of Trinity Grove.

There is a reference in the Travers Survey of 1695 to the route of the Gang Lane conduit running through Maidenstone Hill to 'the brick grounds', suggesting that brick-making took place in the area, but no details are given. There is no mention of this activity that the author can find elsewhere, but an archaeological study carried out in 2004, prior to the construction of the house at 27 Point Hill, found that on part of the site there was evidence of a filled 'quarry pit', the estimated age of which was from the 18th or early 19th century.

Just outside the study area, there was a brickfield located in an area known as 'Mount Nod' (or Nodd), to the south of Blackheath Road and the west of Lewisham Road. Further information can be found below in the 'South of Blackheath Hill' section.

Gravel

Used in the building industry, for road construction and repair, and for ships' ballast, large amounts of gravel were extracted from pits on Blackheath up to 1870. On Maidenstone Hill, there is a reference in the 1751 document to sand, loam and gravel pits 'on the northwest side of the hill' in 1683, probably around the junction of Maidenstone Hill and Blackheath Hill.

In 1718 the New Cross Turnpike Trust came into being; the main task of the Trust was to maintain and improve a network of main roads in what was northwest Kent. As gravel was the most important material for the construction and repair of roads, the Trust was given the right in principle to dig it from 'waste' or 'common' land close to their network.

In 1719, Thomas Steers was supplying gravel to the Trust, and in 1724 he was described as '…digging and carrying away gravell, sand and stone'. In 1741 Morden College granted 'the Commissioners of the [New Cross] Turnpike [Trust] a lease to dig gravell on Maidenstone Hill'... subject to '…digging in convenient places.' The Trust was required by the College to work a site of at least half an acre.

Digging, which may also have included sand, chalk and 'stones', lasted until at least 1748 and the material from Maidenstone Hill was used for repairing roads across the Trust's network. In 1742 the Trust recorded that 5,223 loads had been taken from Maidenstone Hill since the previous year and in 1743 it noted that the amount of gravel removed had enabled it to widen the road that came to be known as Blackheath Hill.

Further down the hill, at the small settlement known as 'The Lime Kilns', the College permitted the Trust in 1745 to dig more gravel and widen the road. In 1749 however, a successful legal action against the College by a lessee who demonstrated his right to extract gravel meant the Trust was not able to continue using Maidenstone Hill as a source.

There was a gravel pit on the corner of Blackheath Hill and Point Hill, which had probably ceased production by 1736. The site is now occupied by the flats at Point Close. Reference is made to Innocent Steers for '… digging and carrying away the gravel, sand and soil of Maidenstone Hill.' There is also a mention of a Joseph Brand '…digging great quantities of gravell.' The 1751 document accuses the Steers of helping themselves to 'gravell, sand, soil and stone.'

A reference in the Morden College minutes from 1774 refers to the replacement of a fence around a gravel pit at the '...top of Maidenstone Hill.' From the description, the fence followed roughly the line from the corner of the Point Close estate on Blackheath Hill to Point House on the corner of Point Hill and West Grove.

In 1776, Michael Searles, a leaseholder of land from Morden College, reported that both '…the Parish and the [New Cross] Turnpike Trust…' had spent '…many years digging and carrying away gravel from the Hill', despite the terms of the Act of 1771 which forbade it, although the Trust responded that they had not done so since 1775.

The Proceedings of the Vestry of the Parish of Greenwich record in 1817 that gravel used for resurfacing local streets was taken from a site adjacent to the '…road from Royal Hill to Blackheath' (likely to be what is now the upper part of Point Hill), thereby also enabling the widening of that road.

Chalk and Limeburning

The burning of chalk (or limestone) to produce lime for mortar was essential for the building industry, until largely superseded by Portland Cement in the 19th century. As well as for mortar (made with the addition of sand), lime could be used for stucco (a type of plaster for external protection and ornamentation) and limewash, a type of paint. Lime was also very important for agriculture, where it was used for soil improvement, principally to neutralise acidity.

'Quicklime', also a product of limeburning, was used to deodorise and disinfect cess pools, and in burials to mask odour and prevent the spread of disease. Contrary to popular belief, however, it does not hasten the decomposition of bodies, but in fact delays it.

Chalk was also used for constructing and repairing road surfaces; it is highly likely that repairs to the local New Cross Turnpike Trust roads in the 18th and 19th centuries were made with material from Maidenstone Hill and adjacent sites to the south of Blackheath Hill.

If chalk was to be burned, it was done in kilns; given the difficulty in transporting the stone, these were usually built close to the point of extraction. The process

generated unpleasant fumes and acrid smoke, and quicklime was a volatile product capable of producing great heat if it came into contact with water, so kilns needed to be situated away from residential areas. The work was dangerous to both limeburners and passers-by – there are newspaper articles reporting fatalities in the kilns and pits around Blackheath Hill; causes of death included burning, asphyxiation by carbonic acid gas and falling from a height.

SHOCKING ACCIDENT.—About two o'clock yesterday afternoon, as a lime-burner of the name of Joseph Bell was attending his duty at the lime kiln of Mr. Benjamin Smith, at Mount Nod, Lewisham-road, he by some means was precipitated into the burning furnace below. It was fortunate that some fresh lime-chalk had only recently been put on, or instantaneous death must have ensued. One of the boys assisting in serving the kiln arrived at the head with a fresh basket of stone, and not seeing Bell called to him as loud as he could, and at that instant a puff of wind cleared off the smoke below, when he discovered his master lying on his face over the burning limestone. He had the presence of mind to drag him from his perilous situation by his legs, and then gave the alarm. A medical gentleman of the name of Proctor fortunately was passing at the time, and every assistance was afforded by him and Mr. Hoare, surgeon, of Blackheath-hill, who shortly after arrived, to ease the sufferings of the unfortunate man; but after the lapse of half an hour he was removed to his house in an insensible state.

Fatality at a lime kiln near Blackheath Hill.
Extract from the Morning Post*, 23rd November 1838*

There were at least three kiln sites in the Maidenstone Hill area recorded in the 18th century: in the vicinity of Plumbridge Street; around Trinity Grove; and close to the junction of Maidenstone Hill and Blackheath Hill – the approximate locations can be found on Map 5. There were other areas of chalk extraction and a number of kilns to the south of Blackheath Hill.

There are no visible remains of the local kilns and the author can find no historical images. However, the dimensions specified on the leases granted by Morden College for chalk extraction and limeburning give an idea of the size – a maximum height of 17 feet 6 inches (5.3 m). Kiln design was similar across the country, and changed very little until the industrial revolution – an illustration based a document dated 1808 has been included below to give some idea of what might have happened locally.

Essentially, kilns comprised a brick- or stone-built chamber, open at the top and with one or more 'draw holes' at the base. The fuel - wood or coal - and pieces of rock would be loaded from above, and the burned lime extracted from below. Those owning or operating the kilns were known as limeburners.

By Royal Command

The earliest record of chalk extraction around Blackheath Hill dates from 1590 in the reign of Queen Elizabeth I when the limeburners were ordered to cease their activities whilst the monarch was in residence at the palace in Greenwich. The Acts of the Privy Council note that '...the lessee, having been ordered not to carry on his trade when the Queen was in residence in Greenwich, on account of the smoke, petitioned the Privy Council to have some remission made in his rent to recoup his loss.'

Demand for chalk increased considerably following the Great Fire of London in 1666, when the city was being reconstructed. However, apparently Blackheath chalk was not of the best quality and Christopher Wren is said to have refused to use it in the reconstruction of St Paul's Cathedral. Records of local chalk extraction become more detailed from the late 17th century.

In 1677 took place the oft-quoted event of William Steers being fined £40 for 'not filling up, supporting and making good, safe, and secure the King's Highway there against his Lime Kilns leading from Deptford to Blackheath, which said highway he hath undermined by digging, taking and carrying from thence great quantities of chalk.'

The 1751 document lists a number of 'encroachments' in the late 17th century onto land that the Crown claimed as its own, including one by Thomas and Hester Steers – William's son and widow respectively – in 1691; they were also named for the same reason in the Travers Survey of 1695.

There are no remains of the lime kilns that were built on or around Maidenstone Hill, and no images can be found. However, the basic design of these structures remained unchanged for centuries. This illustration shows limeburners firing a flare kiln in rural England in 1808, taken from a contemporary drawing

By 1683 a settlement known as (the) Limekilns or Lime Kilns had grown up around the junction of what are now Blackheath Hill and Greenwich South Street. References in documents to the Lime Kilns as an area of Greenwich can be found until at least 1855. Greenwich South Street was formerly known as Limekiln Lane, Blackheath Hill as Limekiln Hill and Blackheath Road as Limekiln Road.

Greenwich Hospital

Greenwich Hospital records in 1706 that Thomas Steers was supplying it with 'lime'. This could well mean that as the hospital was then under construction, material from Maidenstone Hill was being used in the mortar. The Hospital also noted in 1707 that Steers was digging chalk on the hill.

In 1713 a lease was granted by Morden College to Thomas Steers to dig chalk, up to 1734. Steers was limited to one kiln and the terms also specified '...no digging away of the hill or highway and protect cattle and people from falling into pits.' The new lease was to commence on the 'expiration' of the existing one. According to the 1751 document, in 1724 Thomas Steers was '…digging and carrying away gravell, sand and stone…' (presumably chalk). He was supplying material to the New Cross Turnpike Trust around this time, including flints in 1729. The pit is the largest recorded with any accuracy on Maidenstone Hill. It had ceased being used by 1734; Steers died in 1735.

In 1718, the New Cross Turnpike Trust records that it was supplied with chalk by Elias Wood, a limeburner from Lewisham, and in 1726 with flint. Wood owned land on the south side of Blackheath Hill, opposite the junction with Maidenstone Hill, part of a larger chalk quarry in that location.

The records of the Greenwich Parish Vestry meeting in 1733 mention a 'Mr. Steeres', and his record of '… destroying the herbage [surface] of the [Maidenstone] hill.' The minutes also state that the Vestry and Steeres agreed to meet to discuss compensation for the latter's '…carrying away the soil of Maidenstone Hill', but do not record the outcome.

The New Cross Turnpike Trust records in 1733 that a number of individuals using the local roads – including Elias Wood, 'Mr. Steers' and Captain Hammond, all limeburners – were required to contribute additional sums of money towards the maintenance of the section of what is now Blackheath Hill between the Lime Kilns and Deptford Bridge, presumably as their carts of lime and other heavy material were damaging the road surface. In 1739 the Trust mentions the use of its roads to access Deptford Wharf by Innocent Steers, and was investigating installing a toll bar on this route in order to recover some of its costs. The implication of these records is that material was taken out of the area by water along Deptford Creek and into the River Thames.

Collapse and Eviction

In 1735 Morden College minutes mention a lease granted to Robert Hammond for '...two pieces of land adjoining Maidenstone Hill to dig chalk.' Although the exact locations are not specified, a map dated 1770 refers to a Captain Robert Hammond having had a lease on land in the Lindsell Street area below Trinity Grove for 'digging chalk and burning lime' which in 1735 had caused part of the cliff face created by quarrying to collapse. The cliff face can still be seen to the west of Trinity Grove, with the 'kink' caused by the collapse also visible just to the north. In 1735 the College also agreed to the supply of 'lyme' from Mr. Hammond. Coincidentally the same minutes mention an 'ejectment' (i.e. an eviction) brought against 'the Steers'.

Matthew Robinson was granted a lease from 1737 to 1758 to dig chalk from two sites: one adjacent to 'the old chalk pit', (approximately 0.16 ha. in size) in the vicinity of what is now Trinity Grove, and a smaller one (of approx 0.04 ha.) to the west of what is now Dutton Street. The terms of the lease required Robinson to level the land that he had worked and fill as much as possible of the worked pit with 'cally', which is the unused upper layers of material from the workings.

The term 'uncallowing' was the action of removing the unused layers. The lease stipulated the way that the chalk should be extracted, including preventing any 'undermining' of the 'cliff' of the old pit by using 'perpendicular' or similar means, and stated that all chalk should be burned on site. The number of kilns was limited to two, with a maximum height of 17 feet 6 inches.

However, as mentioned previously, Robinson was reported in 1739 as being bankrupt, so may not have been able to complete his proposed works. A lease granted to Innocent Steers in that year suggests that this might have been the case. This lease was for the mining of '...chalk, flints, sand, gravel and loam', on a site to the west of 'the old pit'. The terms of the lease were very similar to those of the one granted to Matthew Robinson, although the smaller of the two sites was not included; it is not known for certain whether the Steers lease superseded the Robinson one, or both worked the same site.

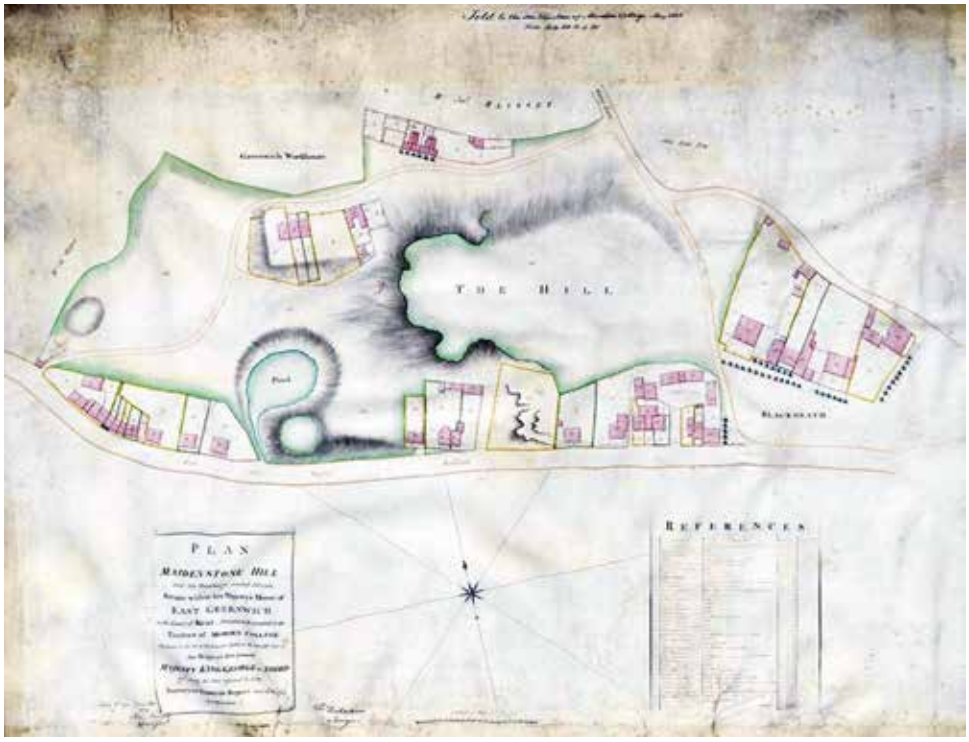
Steers' 1740 lease for sand mining also allowed him to dig chalk in the area around Trinity Grove. Both leases were granted to 1760, although they may have been terminated prematurely given the commencement of the legal dispute between the College and the Crown in 1751. No other leases were granted by the College after 1740.

The Old Chalk Pit

Of the two pits on the hill that were mapped to any degree of accuracy, the larger was located around the northern end of the Undercliff block of flats. It was accessed by a track from Blackheath Hill, roughly along the line of the eastern part of Dabin Crescent.

Its exact age is not known, but there were lime kilns on the site in use by Thomas Steers in 1731, with chalk probably having been dug since at least 1713; by 1734 the pit had ceased to be used. Morden College records indicate that the area leased covered about 0.29 ha, although the pit itself, as opposed to the access road and kiln sites, was smaller and was limited to the eastern part of the site. Measured from the map below dated 1772, the pit was approximately 58 metres in diameter.

By 1737 it was known as 'the old lyme kiln' or 'the old chalk pit'. By 1770 it had become filled with water and had become known as 'the pond' (or 'the drain' on one map). Maps from 1770 and 1772 show the water being drained onto Blackheath Hill along the line of what is now Maidenstone Hill - to achieve this must have required a fairly deep channel at the point of exit from the pit.



Map of the Morden College Maidenstone Hill Estate in 1772. The 'Pond' at the centre-left is the remnant of 'the old chalk pit', the largest of the recorded pits on the hill. At this point it is being drained onto what is now Blackheath Hill

The pond remained until at least 1785, but by 1805 had gone, having been filled in, although the terms of a lease on the site issued that year still specified that the land had to be 'raised and drained', before a garden could be made over it. The land remained open until about 1847, when Holy Trinity School was built over it. The school and the adjacent Holy Trinity Church had been demolished by the early 1950s and replaced by the Undercliff block of flats.

The latter required deeper foundations than usual at its northern end, although the reason was the existence of what were possibly filled former underground workings rather than the reclaimed land on the surface. However, the various instances of subsidence within the vicinity of the church and on Maidenstone Hill (the road) could be explained by the proximity of the old pit, the access road and the drain.

The drain is not shown on any map after 1772, although it did exist after that date. In 1822 the Greenwich Parish Vestry unsuccessfully requested that the New Cross Turnpike Trust replace the open drain with a brick drain running down to Blackheath Hill.

In 1839 a letter to the Vestry from the 'Committee for Erecting Trinity Church' states that 'The lane at the lower side of the Church [Maidenstone Hill] is very narrow and winding and occupied as to a considerable portion by a wide deep and offensive open ditch or drain.' The Committee proposed to cover the ditch; the Vestry stated that the matter was not within its remit and the eventual outcome is not recorded, although the ditch seems to have gone by the time the church was completed in 1840.

Notwithstanding the issues with accuracy of mapping, the old pit appears to have been very close to Blackheath Cavern, and there is speculation, although no evidence, that the two might have been linked. The smaller of the two pits shown on the map above, to the lower left, measured about 24 metres across at its widest. It is not completely clear from the records what was quarried here, but most likely to have been chalk.

South of Blackheath Hill

Just outside the study area, on the south side of Blackheath Hill, bounded on the west by Lewisham Road, and on the east by Morden Lane, was a large chalk quarry. The quarry dates back to at least the 18th century; it is shown on a map dated 'circa 1690-1710'.

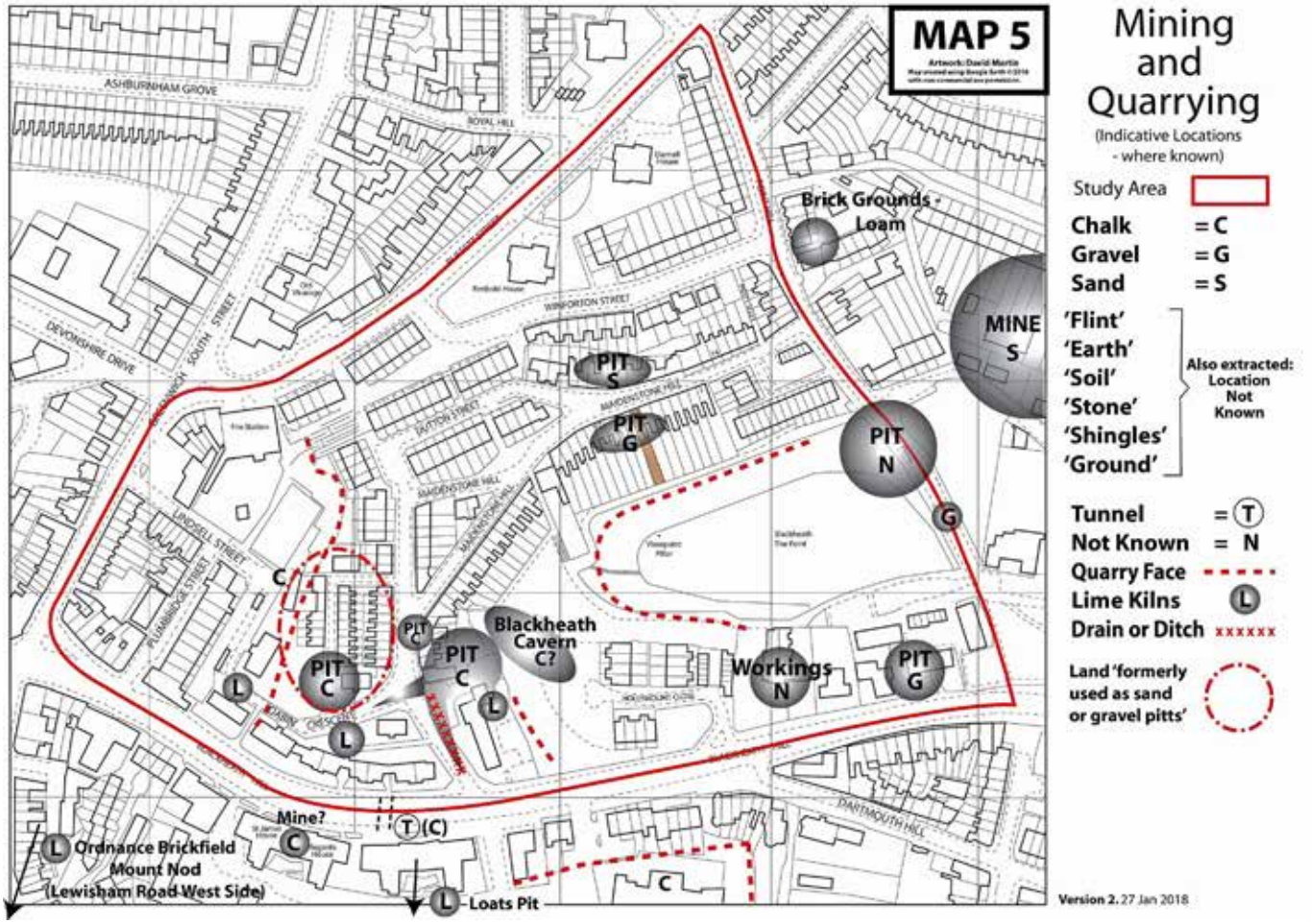
By 1739 much of the site was owned (or leased) by Sir Jacob Acworth, who at that date was the Surveyor of the [Royal] Navy, a post responsible for leading on the design, building and maintenance of the fleet. Acworth's Will of 1749 refers to a part of his site as the 'Chalk Cliffe'. Property deeds dated 1775 relating to the site also refer to the 'Chalk Cliffe' and two lime kilns.

By about 1782, the eastern part of the quarry, directly under the cliff, was no longer used for chalk, later being converted into a large landscaped garden. By 1800, the western part of the quarry was known as 'The Pits', and by 1844 also as the 'Lime Pits', 'Loats Pit' (or Loat's Pits), probably after Lancelot Loat, who had owned the pit since at least 1808. Loat was a local lime burner and brick and tile maker, who amongst other things supplied the New Cross Turnpike Trust with flints and gravel for its roads.

The site, together with a number of lime kilns, was in active use until at least 1845. Other parts of the quarry were developed for terraced housing in the first half of the 19th century; a map of 1860 shows a gravel pit in the southwest corner of the site. Most of the remainder of the quarry was developed for terraced housing in the second half of the century, with the whole of it redeveloped after the Second World War, and then again in the second decade of the 21st century.

'The Pits' was described by a former resident, born there in 1798, as follows:

Slightly further away, to the west of Lewisham Road and south of Blackheath Road, in an area known as 'Mount Nod' (or 'Nodd'), one lime kiln is recorded in the Greenwich Parish Rate Books in 1838, five lime kilns in 1841, and six in 1842; there are no mentions



Former mining and quarrying sites in the Maidenstone Hill area. NB - Map 5 is taken from a parent document. Maps 1 - 4 are not included in this article

But three-quarters of a century ago little of comfort or respectability was to be seen in the vicinity of the 'Pits.' The *tout ensemble* of the place left the impression in one's mind that at some time or other a vast upheaving of the earth had occurred, by which the houses were knocked into all sorts of shapes, and jumbled together in helpless confusion. Some were sunk into the ground, some reclining half on their sides, and others bending forward to embrace one another;—the delapidated appearance, and irregular conformation of the whole forming but too correct an index to the delapidated fortunes, and irregular mode of living of their occupants.

A description of 'The Pits', to the south of Blackheath Hill, in 1798. Extract from the Woolwich Gazette*, 15 February 1873*

after that date. A newspaper report from 1838 mentions a lime burner having been overcome by carbolic acid fumes from a kiln in this location; the same article refers to local chalk digging.

Bricks and Housing Growth

In the same area, there was a brickfield, in use by 1822 and owned by Lancelot Loat from at least that date until at least 1828. By 1836 it was known as the 'Ordnance Brickfield', and advertised for sale, described as being 'greater than five acres' in size. By 1837 it was known as 'Smith's Brickfield'; the Smith in question was Benjamin, who was described as 'a coal merchant and stone mason' in the local newspaper in 1838, based at Albion Wharf, Deptford Bridge. Smith owned at least one of the local lime kilns.

By 1839 the site was known as 'Mr. Davies's brickfield'. The 1841 Census describes it as 'Mount Nod Brickfield', but in the 1843 Tithe Survey it is again recorded as being owned by Smith. The boundaries may have changed over time, but the Tithe map shows the brickfield located between the present-day Lewisham Road, Morden Hill, Coldbath Street/Silk Mills Passage and the southern boundary of Morden Mount Primary School.

The brickfield itself is recorded in the Parish Rate Books until 1846, after which reference changes to locate other properties 'to the north of the brickfield', up to 1864. It is recorded as a brickfield in the 1850 Electoral Register. The site was developed for housing by 1864, then redeveloped by 1967.

Conclusion

The research that has generated this article shows that even under what today is a heavily urbanised environment, a wide range of products have been extracted over the years. It also shows that with a little digging in the archives the geological, historical and human stories behind this exploitation can be unearthed. Many of the products did not travel far from their extraction site but their exploitation helped shape the built environment that we see today on the surface.

30